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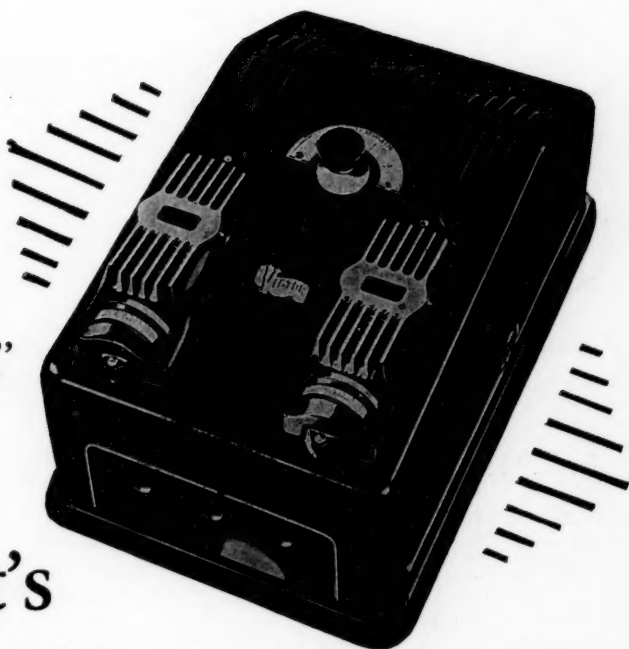
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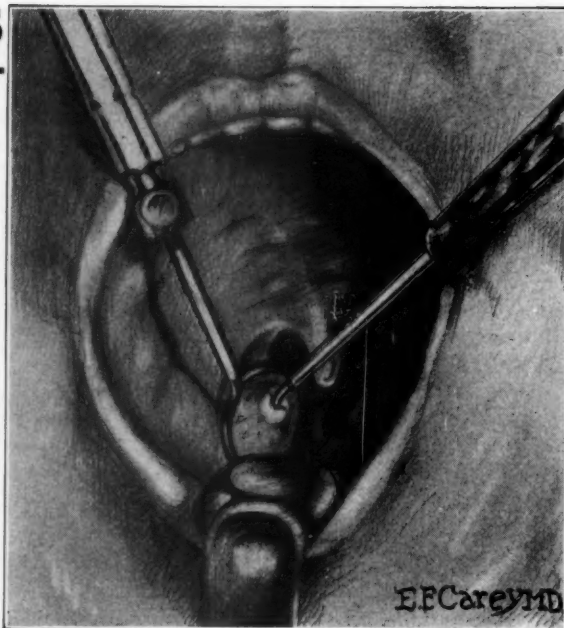
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APPLICATION OF PHYSICAL THERAPY MEASURES IN THE TREATMENT OF BURNS*

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ANN ARBOR, MICHIGAN

It is the object of this paper to describe the application of some valuable physical therapeutic methods used in conjunction with the surgical treatment of extensive burns. The agents employed were ultraviolet radiation, heat producing radiation, massage, passive motion, and active exercise. The patients treated by these methods were suffering from burns which had denuded at least two hundred square inches of the body surface; their general condition was poor and their wounds were heavily infected.

After the admission of the patient to the hospital, supportive treatment was given, such as the subcutaneous injection of saline, blood transfusion and the general application of heat. When the general condition was improved, all necrotic material was removed by surgical means from the wound surface.

After these measures had been carried out the next step was the preparation of the wound surfaces, so that skin grafting would be successful. In the case of patients with such lesions it was imperative that all transplants should grow since the limited amount of normal skin did not permit more than one trial.

The physical therapeutic measures used in preparation of these wounds were continuous heat and ultraviolet radiation. The heat was derived from an "oven baker" containing five tungsten filament bulbs, consuming twenty-five to sixty watts of current per bulb. The apparatus was suspended from a Morrison frame, a rod extending longitudinally over the middle of the bed, so that it would not interfere with nursing care. The air was maintained about the injured parts at a temperature of 100 degrees Fahrenheit by placing a sheet over the baker and frame to exclude air currents.

In preparing the wounds for ultraviolet radiation it was necessary to apply some form of moist dressing which would help to keep

the surface free from accumulations of fibrin and pus. This dressing had also to be of such composition that it would not injure the granulation tissue or cause the patient great pain upon its daily removal.

A trial was made of various types of dressings and medication, the most satisfactory combination proving to be one of a single thickness of a perforated fabric applied next to the wound and covered with gauze saturated with normal saline. To prevent rapid drying of the gauze, the dressing was partly surrounded with a sheet of gutta percha.

Ultraviolet radiation was used in the preparation of the wound surfaces for skin grafting since it helped to decrease the amount of infection on the surface and permitted a more rapid formation of healthy granulation tissue. Experience with the treatment of other wounds had shown that care must be used in prescribing the amount of radiation administered if there is not to be destruction of the newly formed tissue.

In the determination of dosage and treatment of the patient the mercury arc lamps were operated at a potential of seventy volts and at a distance of twenty inches from the patient. The rate of output of radiation from a particular lamp and the patient's skin sensitivity to this radiation were gauged by determining the length of exposure necessary to cause a standard intensity of erythema. This was accomplished by exposing small areas of skin over the scapular region for different lengths of time; the first distinct homogeneous erythema resulting from the shortest exposure represented a skin erythema dose.

Again, previous experience indicated that in heavily infected wounds the best results were gained by an initial exposure of one hundred to one hundred and fifty per cent of the erythema dose. The second and third treatments were usually decreased in intensity and further radiation administered in doses

* Read at the Ninth Annual Meeting of the American Congress of Physical Therapy, St. Louis, Mo., September 8, 1930.

of about seventy per cent of the erythema time.

It was expected that by such a procedure, sufficient bactericidal effect could be gained without injuring the newly formed tissue. This belief was substantiated by a determination of the length of time required to kill bacteria when placed on culture media. The test was performed by inoculating a blood agar plate with a suspension of material taken from the surface of a patient's wound. Small areas of the plate were then exposed to quantities of ultraviolet radiation, measured in terms of the patient's erythema reaction, and the plate was incubated for twenty-four hours. It was found that practically all growth was inhibited by an exposure to one-fifth of an erythema dose and that two-fifths or more, completely killed all organisms on the surface. The organisms in this instance were *Staphylococcus aureus* and a strain of *Hemolytic Streptococcus*. In the lower right-hand corner of the photograph is a dark area which received the minimal dose. The two areas above it received two-fifths and three-fifths.

From this test it appears that less than seventy per cent of a skin erythema dose was sufficient to cause destruction of the organisms on the surface. Clinically, the laboratory test was substantiated by the rapid disappearance of much of the infection, although the wounds were never entirely free from bacteria. Within a period of about two weeks after daily treatment of this type was instituted the wounds were ready for skin grafting.

The surgeon used both large and small Thiersch grafts, depending upon the amount of skin available. Ultraviolet radiation was restarted within three to six days after operation, in order to prevent the development of marked infection which would interfere with the grafts. It was observed that with this exposure and with the continuation of normal saline dressings the infection was not only held at a minimum, but there was a rapid spread of epithelial tissue from the grafts. The rate of tissue proliferation was frequently as rapid as one millimeter in twenty-four hours.

From these observations it appears that the effect of ultraviolet radiation on these wounds may be attributed to the following factors: first, a bactericidal effect upon the surface or-

ganisms; second, production of an active hyperemia which increases nutrition and local bactericidal action; and third, perhaps a stimulation of cell growth.

During the time when the patients were being prepared for skin grafting the possibility of contractures was not forgotten. Whenever possible the joints were moved through their full range at least once a day. If the patient could carry this out actively he was allowed to do so, but if unable, passive motion was employed. This mobilization and the proper splinting undoubtedly helped to maintain the parts in better functional condition.

As soon as the surface was adequately covered with epithelium, massage was instituted and the amount of motion increased. This early employment of massage, while the fibrous tissue was still in a pliable state, helped to prevent contraction of the injured parts. At the same time that massage was started the patient was given various interesting and useful occupational exercises. These assisted in the development of function and coordination, without directing the patient's attention toward the injured condition. This treatment was particularly adaptable to one patient who had suffered from extensive burns of both arms and the right hand. In this instance games, basketry and letter writing were used to advantage. The patient enjoyed the diversion and was encouraged by the gain in functional activity.

In order that the results of the treatment as outlined may be portrayed more graphically, a number of case histories are included as part of the discussion; the accompanying photographs illustrate the progress exhibited by the patients.

Name: W. M. Age, 27. White, male.

Admitted: 7-2-30.

Chief complaint: 3rd degree burns of both legs.

Present illness: On 6-21-30 patient suffered burns of two-thirds of the surface of the left leg and one-half of the surface of the right leg. Marked infection of all surfaces at time of admission.

7-2-30. Hgb. 84 per cent. R. B. C., 4,800,000. W. B. C., 18,400.

Urine, no pathology.

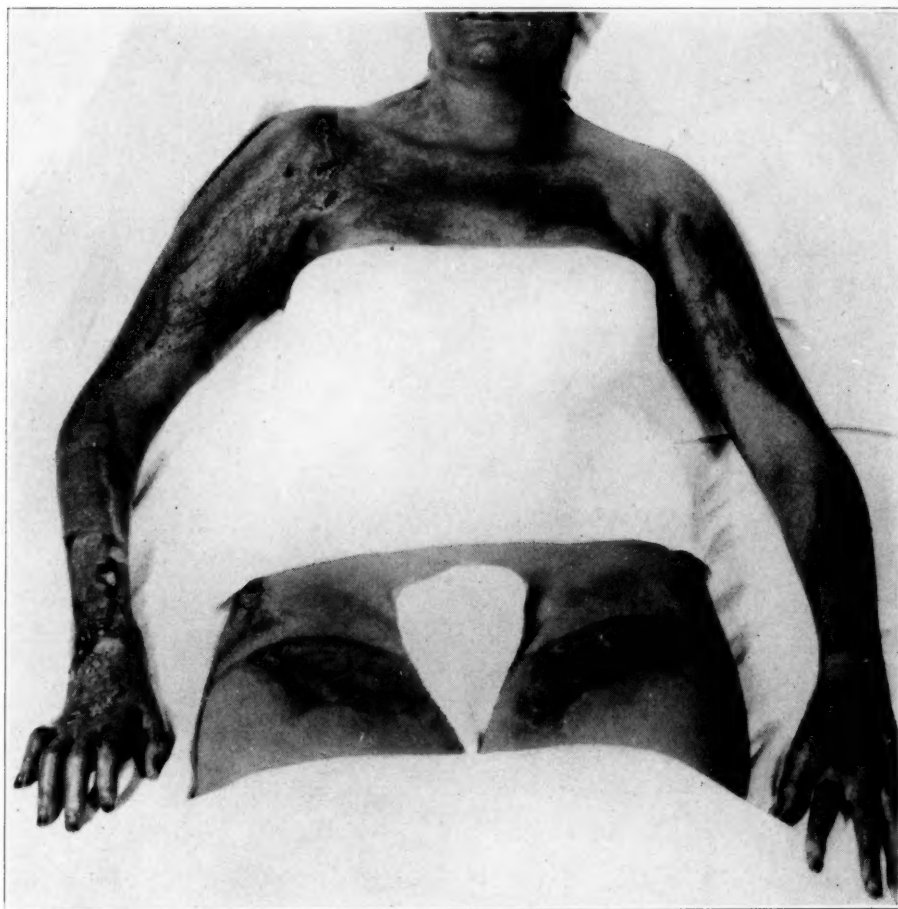
(Treatment as described in this article was instituted.)

7-21-30. Skin graft on inner side of right thigh.

7-26-30. Remainder of right leg and all of left leg grafted.

8-15-30. Assistive active exercise started—feet and knees.

FIG. I



Case E. W. Before treatment was instituted.

8-24-30. All dressings removed—legs in excellent condition.

Name: E. W. Age, 20 years. White, female.

Admitted: 3-10-30.

Chief complaint: Third degree burns of arms, chest and thighs.

Present illness: 2½ weeks previous to admission the patient was burned when kerosene exploded in can.

Patient remained at home, dressing soaked in oil being used to cover burned areas. Her condition became steadily worse and she was brought into the hospital in a state of coma and marked dehydration. She was immediately given normal saline intravenously and subcutaneously and blood transfusion performed.

Hgb. 53 per cent. R. B. C., 3,620,000. Urine, few white blood cells, no red blood cells, occasional waxy cast.

3-28-30. Treatment as described in this article was instituted.

3-31-30. Exercise to 5-26-30.

4-7-30. Massive Thiersch grafts were applied to thighs. Compression applied by

means of soft rubber pads between the dressing and the bandage. This was removed at the end of three days. Ultraviolet application restarted.

4-10-30. Skin graft to left arm.

4-15-30. Skin graft to upper right arm, 40 sq. in.

4-21-30. Skin graft to lower right arm, 50 to 60 sq. in.

4-29-30. All grafts are growing. Patient sits in chair daily.

5-8-30. Banjo splint applied to right arm to prevent deformity.

5-27-30. Hgb. had risen to 78 per cent.

6-2-30. Discharged.

Name: J. H. Age, 9 years. White, male.

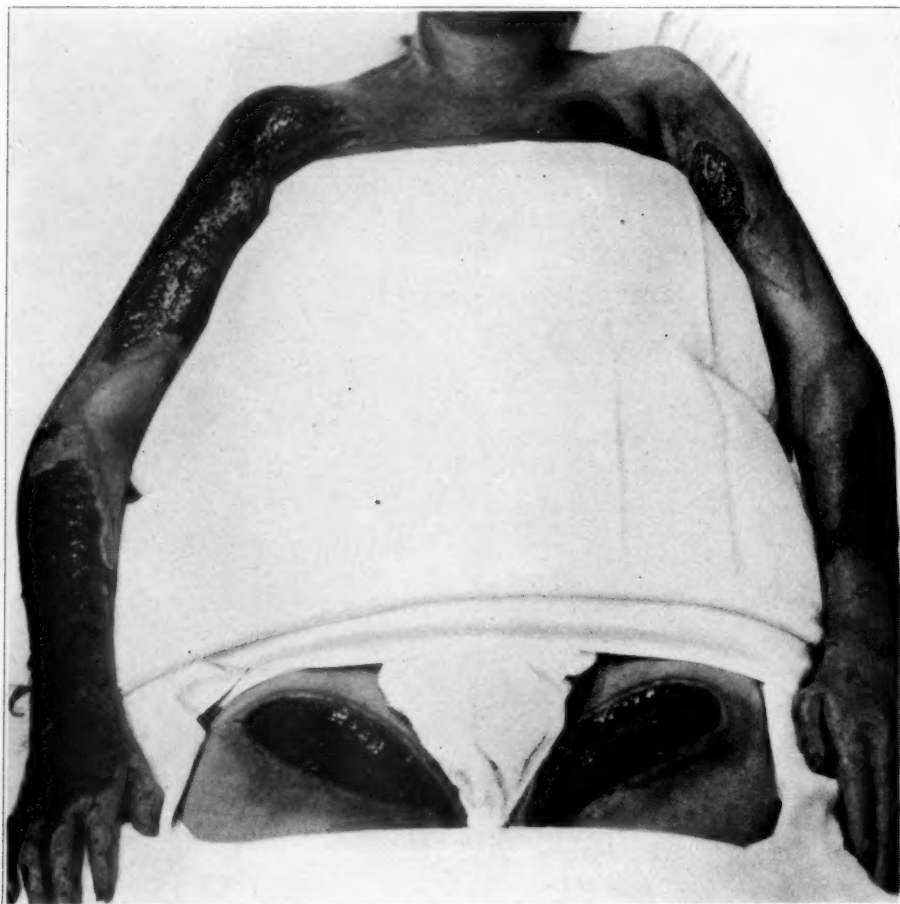
Admitted: 6-28-30.

Chief complaint: Third degree burns of back and right leg.

Present illness: Approximately 80 per cent of the surface of the right leg and 33 per cent of the back received third degree burns.

Patient treated in another hospital for four weeks.

FIG. II



Case E. W. Note the condition of the granulation tissue two days previous to the start of skin grafting.

6-28-30. Entered hospital as an emergency—leg wounds heavily infected—wound on back fairly clean. Wet dressings.

Hgb. 55. Sahle. R. B. C., 3,666,000. Whites, 5,150. Urine, no evidence of pathology.

(Treatment as described in this article was instituted.)

7-1-30. Thiersch grafts, cut in pieces about one inch square, were applied to wound on back.

7-11-30. Thiersch grafts, posterior right thigh.

7-16-30. Thiersch grafts, rest of right leg.

Summary

This paper contains an outline of physical therapeutic measures which may be used in conjunction with the surgical treatment of extensive burns requiring skin grafting.

The preparation of the wound for skin

grafting is described as well as the technic of applying ultraviolet radiation.

The early use of active motion, massage, and therapeutic exercise is considered.

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Discussion

Dr. Norman E. Titus (New York City): Dr. Peck is very fortunate in having had the opportunity to treat cases that are chronic and in need of skin graft. I have seldom seen any but the very acute types and hence my opinions may be different from those presented by the essayist.

First of all, we also have used radiant light for these types of cases, keeping the light on continuously day and night. We do not, however, use the same technic as described by Dr. Peck—cover the light applicator with the sheet. I have seen too many accidents in which normal tissue and fresh epithelium was burned and blistered by excluding the circulating air. I personally believe it is improper technic not to allow a change of air underneath the light baker. We always keep one end open and cover that with mosquito netting to keep flies away.

I can recall one case of an extensive burn, extending from the waist upward to the neck on the back and front which was kept in the hospital for nine weeks, lying on wooden blocks supported at the shoulders and hips, on whom nothing else was used but light. It was, of course, a very acute case.

When we first started treating these cases about nine or ten years ago, we used the mercury arc lamp and thought we were getting wonderful results by giving them an erythema dose two or three times a week. We found that

FIG. III



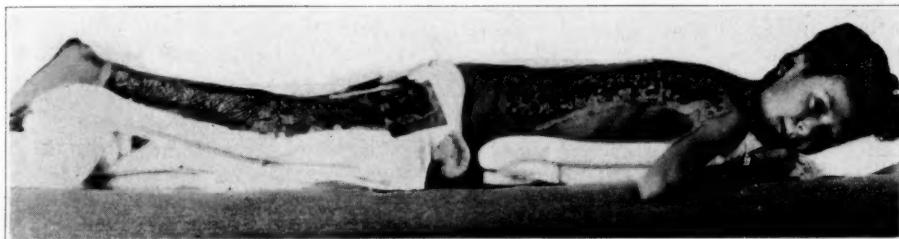
Case J. H. Before ultraviolet treatment was instituted.

I can recall now at least fifteen cases that were burned by leaving them under a light applicator without allowing the normal perspiration to evaporate and keep the skin cool. I think it is extremely important to always have circulating air under a light applicator, because the evaporation of perspiration is a very great help, and when it is not allowed to evaporate, it can burn the skin. I have seen it done.

the surface was beautifully glazed over immediately, and we were quite elated with the progress. Then we discovered that this glazing was merely the result of coagulated serum which easily became infected and the cases made worse. I now realize that a full erythema dose is deleterious to regeneration of tissue and hence it has been discarded in the treatment of these patients.

We have adopted a technic of using the mer-

FIG. IV



Case J. H. Note the advancement of epithelium from margins of the grafts following ultraviolet radiation.

In regard to the covering for the burns: in England they have a very clever way of first putting on paraffin gauze, and then applying the mercury arc lamp to stimulate the underlying tissue. The short, irritating rays are then absorbed and the long tonic rays are thus permitted to pass through the paraffin gauze without the need of having it removed; consequently, they do not have to disturb the burns at all. I mention this technic because it appeals to me as a logical method of application.

In the cases under our supervision, we always kept the wounds clean with 10 per cent boric in normal saline. They were washed off three or four times a day, but, as I say, they were never covered with anything at all but a light applicator which was kept on day and night.

cury arc lamp, working at its full intensity for twenty seconds at twenty inches. We administer this dose only once a week to the cases that are kept continuously under light. We use that merely as a whip or a stimulant. I have been using such a technic and dosage for the last two years in the operating rooms at the Presbyterian Hospital in connection with cases that were going to have grafts put on them. Not all were necessarily burn cases. Very often I did not even know the exact nature of the case, but when they were all ready to put on the graft and ultraviolet was given to the area upon which the Thiersch graft was about to be placed, the results have thus far been very satisfactory. Everybody is most enthusiastic about the complete way the grafts have healed. Ultraviolet light can

therefore be used to hasten local metabolism and to stimulate regeneration process after the graft is in place.

Dr. Peck very properly brought out the necessity for the use of therapeutic exercise as early as possible. Even if you do tear the skin grafts and you do get scars (I have seen elbows where possibly the scars were worse than they should have been), it is much better to have a scar that goes across the elbow and does not interfere with motion than to have a linear scar that runs along the arm and embarrasses motion. I remember the case of a lady who accidentally moved her arm in her sleep and tore the long scar open, which inhibited extension and resulted in a terrific hemorrhage from the scar.

It is also of great assistance in these cases, as Dr. Peck said, to use massage, but it must be massage of a very gentle nature, the kind known as circular kneading and stroking. It should radiate from the most healthy tissue towards the tissue that is regenerating, in order to bring fresh nutrition to the denuded area. Massage of that type is indeed of great help.

In acute cases, as I have said, grafting has not been necessary in the majority of cases, for we have had wonderful results when we used a proper dosage of light. I always insist on keeping one end open in order to insure circulation of the air. Infection is a rare occurrence, because the hot and cold air is always in good circulation.

Dr. M. H. Todd (Norfolk, Va.): I want to ask if there is any danger of delayed secondary contraction? Very often such has been observed to take place with other methods of treatment.

Dr. J. S. Hibben (Pasadena, Cal.): I would like to ask Dr. Titus if that paraffin gauze is prepared commercially or if they make it themselves.

Chairman Walke: I did not know that ultraviolet would penetrate a gauze of that kind. Would it penetrate ordinary Amberine?

Dr. Titus: It is the ordinary stock paraffin gauze gotten out for burn dressings.

Chairman Walke: I have been practicing industrial surgery for many years but I have never seen a burn more extensive than was recently brought to my hospital service. It was the case of accidental electrocution of a man who was working for the power company that I represent. His hand and shoulder came in contact with a high voltage current (I have forgotten which one). From the hand to the shoulder, all the way across, the flesh was absolutely cooked, roasted. If you had put him in a roaster, he could not have been any more "done" than that. You could take tissue forceps and pull off, you might say, roasted skin.

Both hands were contracted. His body was burned. His face was burned. When he came to the hospital two hours after the accident he was conscious, and able to talk coherently. He was actually able to joke. Under the most powerful hypnotics (I was giving him the No. 1 H. M. C.'s), that man never lost consciousness until about fifteen minutes before he died. He was

able to joke with us up to that time. He said, "Doctor, I'll see you in the morning. If I could straighten out my hands, I would be all right. The only thing I have is a cramp."

That man's hands were as cold and crisp as could be. In fact, that was the most horrible sight I have ever witnessed as a doctor, the burn from the high tension line. Of course, we expected the man to die. He lived from three o'clock in the afternoon until one o'clock the next day. I stayed at the hospital all night and all day trying to put him to sleep. We gave him H. M. C.'s and added an extra quarter of morphine to it and finally got him so that he wasn't restless. He would talk and shake around in bed a little bit with his lower limbs. The extent of that burn and the depth of the cooking of the flesh was such that I don't see how any human could live some twenty hours after it had happened. I feel that the paper under discussion is very timely and promises great relief to those suffering from accidental burns.

I might say I agree with the doctor a good deal in the fact that we use the baking process; instead of having one end of the sheet or hood up, we have all four sides up. Instead of having it go down completely, we have it raised so the circulation of air can be well maintained. Our hospitals are screened in the South so we have no danger of flies.

Dr. Willis S. Peck (Ann Arbor, Mich.): In closing, I want to correct one misimpression which you might have received about this baker. The wounds in these cases are covered with bandages which are wet. Here you have one or more extremities covered with wet bandages so that the loss of heat is very rapid because of the moist surface. These bakers are suspended and just the ordinary hospital sheet thrown around them which may be fastened with one safety pin over each end. They usually gap a bit, so there is some circulation through there. Then we run them very low and check the temperature carefully. If the wound were fully exposed to the radiant light, I can assure you that I would fear for burns.

Another thing that is very useful, we put most of these patients on Bradford frames. Also for the nursing care, it would save you a lot of trouble if these patients rested on Bradford frames. We used different types of drugs. We used different strengths of hexyresorcinol. Sometimes we thought it worked very well. We used different strengths of acriflavine. We have used some mercurochrome. We have used boric acid. We felt that our best results were gained with simply normal saline. There is a possibility that with some cases you will get toxicity from boric acid. I don't know why, but we had that experience in a couple of cases. Maybe it wasn't boric acid at all; we thought it was.

The dosage cannot be stressed too much. If you give them an overdose, you are going to destroy the fine results already accomplished.

In regard to the active motion, I simply ask you this question. What good is an extremity, no matter how normal it looks, if the patient

cannot use it? I think we must be guided by function in the treatment of these cases, not by cosmetic result.

Late secondary contractures do occur; we get them. The patients go home. It is impossible to keep them under supervision in our hospital, the University Hospital. They come from all over the state, even from the northern peninsula.

We lose contact with the patients. They may be 600 miles away, so we cannot keep a check on them. We try to have the physician who sent the patient to us carry on with the case, but it is a rather difficult matter to instruct a physician who does not know you, or who never saw you, in what he should do after his patient comes home.

SCIATIC SCLIOSIS *

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Sciatic scoliosis is a lateral deformity of the trunk that may be a complication of or a sequel to any painful condition of the lower back or to a sciatic neuralgia. It arises from instinctive efforts to relieve oneself of discomfort. Sciatic scoliosis is not a disease entity; it consists of a group of symptoms which include deformity of the trunk, backache, stiffness of the spine, an altered gait and frequently sciatica. The name sciatic scoliosis arose from the custom of calling any lateral distortion of the spine a scoliosis, and from the belief that this particular deformity always resulted from a sciatic neuritis. Extensive study of and wider experience in this condition have proven that the title is incorrect, as there never is a real sciatic neuritis, and the deformity of the spine lacks many of the characteristics of a real rotary-lateral curvature or scoliosis. We are obliged, however, for the present, to retain the name of sciatic scoliosis, because, firstly, we have none that is better or more appropriate, and secondly, through its universal adoption and use, we understand exactly the clinical condition it represents. Some degree of lateral deviation of the vertebral column may and frequently does occur in such grave lesions as tuberculosis, fracture and malignant disease of the spine, but in these cases one is concerned chiefly with the structural osseous lesion and not with the secondary postural change. The term sciatic scoliosis is reserved for that type of lateral distortion of the back and spine which follows what may be considered a minor, although often very painful, lesion of the lower back, or a sciatic neuralgia.

Symptomatology

Deformity of the back. The most conspicuous feature of sciatic scoliosis is a lateral deformity of the trunk. The body is inclined forward and to one side. The curve of the spine corresponds to that of the body. In a right lateral deformity there is a *right dorso-lumbar curve* of the spine involving the dorsal and upper lumbar vertebrae and a short compensatory curve of the lower lumbar vertebrae to the left. In a left lateral deformity the major curve of the spine is to the left. *The back is abnormally flat.* The normal backward curve of the dorsal vertebrae is reduced and the lumbar lordosis may be obliterated or even replaced by a backward curve or kyphosis.

In a statistical study of 50 cases treated at the First Orthopedic Division of the Hospital for Ruptured and Crippled, made for me by Dr. Nelson of our staff, it was found that in 25 cases in which the status of the physiological curve of the spine was considered, there was flatness of the lumbar area in 21 and a lumbar kyphosis in four. The deformity varies in degree. It may be so mild that the patient is not aware of it, or it may be so marked that the trunk is almost at right angles to the lower limbs. The deformity has two elements, flexion and lateral inclination, and either may predominate. The lateral deviation is the more marked in a large majority of the cases. The deformity is always most marked in the standing position. In severe or protracted cases the deformity persists even when the patient lies down. In all others the asymmetry of the body diminishes or disappears when the individual has rested, lying either prone or supine. In some cases of long standing and in those with marked flexion de-

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formity, the patient may not be able to lie prone and can only be on his back when his lower limbs are flexed. The tilt of the trunk is most frequently *away* from the *painful side*, that is, toward the sound side. In a fair proportion it is *toward* the painful side. Sometimes there is an alternating deformity, so that the body is inclined in opposite directions on different days and even at different parts of the same day. In the series of fifty cases reviewed for this paper the deformity of the trunk was away from the painful side in 62 per cent, toward the painful side in 33 per cent and was alternating in 5 per cent.

Backache. This is the primary cause of the deformity. So far as the patient is concerned, backache is the most important symptom. He often is not aware of the deformity; he may not mind the limp or be disturbed by the stiffness of the back or the tender areas; but he is more or less continuously distressed by the pain in his back. The pain causing sciatic scoliosis is always located in the lower part of the back. I have never seen or heard of an instance of sciatic scoliosis that arose from pain in the thoracic region. The exact site depends upon the underlying causative lesion. Thus in the order of frequency it is referred to the sacro-iliac joints, the lumbo-sacral articulation, the muscles of the buttock, the soft structures of the lower back and the lumbar vertebral joints. When the pain originates in the sacro-iliac area or buttock it frequently radiates down the back of the thigh and leg in the course of the sciatic nerve. The backache varies in degree. It may be mild and inconstant, permitting the individual to continue his work with only an occasional interruption. It may be so severe as to require large doses of sedatives.

The onset may be sudden as in the traumatic cases or insidious as in those secondary to sciatic neuralgia. The backache may be mild for weeks and months and, after some minor injury, or even without any recognizable trauma, become severe. The pain is usually increased by activity and relieved by rest. Most patients find some relief by lying down either on the back or the side with the lower limb on the affected side flexed. Some are more comfortable sitting up. At all times movement that causes tension on the sensitive area increases the pain and hence the back is held rigid. Flexing the spine or raising the lower limbs with the knee in extension always ag-

gravates the discomfort. The pain occurs with about equal frequency on the two sides. In our series of 50 cases it occurred 27 times on the left side and 21 times on the right. In one case the pain was in the middle of the back, involving the lumbo-sacral joint alone, and in one case it was present first in one sacro-iliac area and later in the other. Not infrequently there are several painful areas. The most frequent combination is pain in the lumbo-sacral and sacro-iliac joints. This is particularly likely to occur after an injury. Secondary sciatic pain is a frequent concomitant symptom. In seventeen of a series of 20 private cases the chief complaint was pain in the lower part of the back. In 8 of these there was also sciatic pain. The sciatic pain is found only in instances in which the primary lesion is either in the sacro-iliac joint or the tissues of the buttock. I shall attempt an explanation of this in the paragraph on pathology.

Stiffness of the back. The back is held rigid in the attitude of deformity. There is spasm of the back muscles. As this is a protective mechanism to minimize pain, the muscle spasm is greatest in the upright position. In most cases the spasm relaxes after the patient has rested a while in the prone or supine position. In cases due to sacro-iliac derangement and more particularly sciatica, the spasm may relax when the patient rests in the sitting position. On account of the muscle spasm, the motions of the spine are limited and forced motion is painful. Flexion is more markedly restricted than any of the other motions. Lateral inclination away from the painful side is usually more restricted and painful than motion toward it. Sometimes it is just the reverse. When the patient is resting and the muscle spasm diminishes or disappears, passive motion of the spine may be quite free in all directions. This can be tested easily by having the patient lie prone. After a few moments the physician places his right hand under the patient's chest and exhorts him not to help in any way but to remain relaxed. It will then be possible to move the spine freely and painlessly in all directions. Such a procedure, that is, free passive motion, would be impossible in a case of disease of the spine, and is an important diagnostic point in differentiating sciatic scoliosis from a grave structural affection of the vertebrae.

Gait. On account of the deformity of the

back, the muscle spasm and pain, walking may be difficult, awkward and accompanied by a swaying of the body so that the gait is decidedly abnormal. In the milder degrees of sciatic scoliosis the gait may be altered so little that it may escape detection. When the deformity is marked, and especially when the affected limb is flexed, there may be a very marked limp and need of the assistance of a cane. It is remarkable, and somewhat characteristic of sciatic scoliosis, that a patient with a very painful deformity may prefer standing and walking to lying down. In 26 cases in which the gait was investigated the following was found:

With a definite limp.....	12	46%
Difficulty in walking.....	4	15%
Walking with body stooped forward	5	19%
Guarded gait	1	6%
No limp	4	15%

Tenderness. The painful areas are usually tender to pressure. The degree of tenderness is proportionate to the severity of the pain. Its location plus the site of the pain are the most important symptoms in determining the exact location of the basic lesion. One must, therefore, palpate the back slowly and methodically. It has been my experience that the area of tenderness is rather small and limited to the region of derangement. In a small per cent of the cases there is no sensitiveness to pressure over the painful areas. In 31 cases in which the area of tenderness was specified, the distribution was as follows:

Sacro-iliac joint	13	42%
Thigh and calf (sciatic nerve)...	9	28½%
Lumbo-sacral joint	5	16%
Gluteal region	5	16%
Fifth lumbar spinous process....	5	6%
Muscles in lumbar region.....	2	6%

These figures show that just as pain may be present in several areas, so tenderness may be found in more than one location.

Sciatica. Sciatic pain, sciatic neuralgia or sciatica occurs in sciatic scoliosis either as an independent primary lesion in which instance it is responsible for the deformity, or it may be secondary to a derangement of the sacro-iliac joint or a lesion of the muscles in the buttock. The pain is present in one or more sections of the sciatic nerve or all along its course. Most often the patient has pain in the buttock opposite the sacro-sciatic notch and in the back of the thigh. It may be more

intense in the calf than in the thigh. Frequently the pain begins in the buttock and shoots down the back of the thigh and calf to the foot. There may be a slight atrophy of the thigh and a diminution or even absence of the Achilles reflex. There is tenderness to pressure along the course of the sciatic nerve; its severity is usually directly proportionate to the pain. The patient frequently complains of numbness of the thigh, leg or foot. There is, however, never any actual disturbance of sensation, no motor weakness, no alteration in the patellar reflex and no trophic change. Thus there is a complete absence of the essential symptoms of a neuritis. The nature, etiology and pathology of the sciatic pain are not quite clear. Apparently there is a minor temporary disturbance in the function of the sciatic nerve, due probably to external pressure either on the lumbo-sacral cord in the pelvis or the trunk of the sciatic in the buttock, and best designated, for the time being, as a neuralgia or sciatica.

As the pain in primary sciatica may be very severe, the deformity may be marked. As previously mentioned, the body is sometimes flexed to a right angle, and walking is most awkward. In these extreme cases relief is rarely obtained by medication. The pain comes on in mild form, gradually gets worse and tends to persist. This type of case is the hardest to cure because the pain, even with radical treatment, is slow in disappearing, and we must expect recovery to be delayed longer than in the other types of sciatic scoliosis.

X-ray Examination. In the majority of the cases the roentgen pictures are entirely negative. In some there is an irregularity and haziness of the lumbo-sacral or sacro-iliac joints that indicate the existence of an arthritis of these joints that may be the cause of the pain and the deformity. In some cases there are found anomalies in the lumbo-sacral area, such as sacralization of the last lumbar, a high or low position of the sacrum, abnormally long or bifid transverse processes of the last lumbar vertebrae, spina bifida occulta and so forth. Much speculation has arisen about the relation of these anomalies to the causation of backache. It is my belief that these anomalies have very little to do with sciatic scoliosis for the following reasons: First, in many cases there are no congenital abnormalities. Second, in all the patients the bony malformation has existed for many years,

thirty or forty, without giving rise to symptoms. Third, in many cases there are definite causes like a traumatic lesion to account for the pathology. Fourth, the treatment relieves the symptoms without in any way altering the congenital changes. I do not doubt that in some cases, as in asymmetrical lumbo-sacral joints, there is an increased susceptibility to injury which may result in sciatic scoliosis. But in a given case of sciatic scoliosis, even though there are malformations of the last lumbar and the sacrum, effective treatment can be applied and a cure obtained regardless of them.

The investigation of a case of backache is incomplete without a neurological, gynecological and genito-urinary examination. In sciatic scoliosis in particular one must exclude a lesion of the cord, the meninges, the pelvis or genito-urinary organs. A pathologic change in any of these tissues may give rise to backache and so to sciatic scoliosis. A retro-peritoneal perinephric abscess causes backache and may give rise to a lateral tilt of the body. I have had sent to me two cases diagnosed as sciatic scoliosis that proved to be instances of perinephric abscess. In both cases there was a history of recent injury, the chief complaint was backache and there was a lateral inclination of the body. But there were also fever, leucocytosis, and enlargement and tenderness in the lateral lumbar area which lead to the correct diagnosis and immediate operative intervention and relief. Cases of sciatic scoliosis have been reported as following persistent colonic stasis and distention. This is undoubtedly true, as any condition causing backache may result in a sciatic scoliosis. The important point I desire to emphasize is that a thorough physical examination and study are essential in arriving at an accurate diagnosis.

Illustrative Cases

Case 1. Joseph C., 35 years old, had excruciating pain in the left side of the lower back. This came on 23 days previously after jumping from a table and landing on his feet. The pain, disability and deformity increased until 6 days before I saw him, when he became practically completely incapacitated. He was able to get out of bed only with very great difficulty. There was a marked tilt of the body to the left. There was marked spasm of all of the muscles of the back and the spine was held immobile. There was tenderness to pressure over the left sacro-iliac joint and nowhere else. Flexion of the left lower limb with the

knee in extension, that is, straight leg raising, was completely restricted and caused pain in the left sacro-iliac area. All other tests, including an x-ray picture of the pelvis and the spine, were negative.

This man had a *left sciatic scoliosis* secondary to an acute *sprain* of the *left sacro-iliac joint*. He had a stretching under an anesthetic and immobilization in a plaster spica, in the manner which I will describe later, and was completely cured.

Case 2. Mrs. L. W., 33 years old, hurt her left hip 2 years ago. Soon thereafter she began to have pain in the left side of the lower back and along the back of the left thigh and leg and in the sole of the foot. The pain disappeared but recurred several weeks later during an attempt to get out of bed. When first seen she was in great pain. Her body was inclined to the *right* side. There was marked tenderness over the *left sacro-iliac joint* and along the left sciatic nerve in the thigh and leg. Her back was rigid and there was a *lumbar kyphosis*. There was atrophy of the left thigh and a diminished left Achilles reflex. Gynecological, neurological and x-ray examinations were negative.

This patient had a *right sciatic scoliosis* secondary to a *chronic sprain of the left sacro-iliac joint* with left sciatica. She was cured by a stretching and appropriate immobilization.

Case 3. Emanuel G., 40 years of age, consulted me for pain in the back of his left thigh and leg, and deformity of the body. Five years ago, while straightening from the stooped position, he felt a sharp pain in the left buttock. This lasted several weeks, during two of which he was confined to bed. Since then he has had many relapses. Recently the pain became very severe.

Examination showed that he was a very muscular individual who stood with his body tilted to the right. Flexion of the spine and lateral bending to the *right* were restricted and painful. Lateral bending to the left was free. There was marked tenderness along the left sciatic nerve. There was some atrophy of the left buttock, thigh and leg and a diminution in the left Achilles reflex but no other neurologic changes. Rectal and x-ray examinations were negative. This patient had a *right sciatic scoliosis* secondary to a *left sciatica*.

Case 4. John O., 36 years old, was referred to me for persistent pain in the right lumbar area. Five months previously he lifted a heavy weight. He had immediate pain in his right loin, which has persisted. He had an *alternating deformity* as his body was tilted in opposite directions on different days. His gait was very awkward. His spine was held rigidly and all its motions were restricted. There was marked

tenderness of the musculature in the right lumbar area. There was no tenderness elsewhere and no radiation of the pain, x-ray examination was negative. This man had an *alternating sciatic scoliosis* secondary to a strain of the *lumbar muscles*.

Case 5. Mrs. Lucy J. came to the hospital for Ruptured and Crippled because of pain in the left side of her lower back. She strained her back 3 months previously by lifting moderately heavy objects. The pain persisted. She had a very flat back with her body inclined to the right. There was tenderness of both the lumbo-sacral and left sacro-iliac joints. An x-ray and all accessory examinations were negative. She had a *right sciatic scoliosis* secondary to a *chronic sprain* of both the *lumbo-sacral* and *left sacro-iliac joints*. She was completely relieved by a stretching under anesthesia.

Case 6. Joseph S., 40 years old, came to my office because of disabling pain in the lower part of his back. The pain came on six months previously while lifting a tub of butter. After a rest of a few weeks he felt better and resumed his work, but the pain gradually increased until he had to relinquish his work. The patient was a muscular, vigorous individual. His body was inclined to the left. His back was flat. There was marked spasm in the back muscles and stiffness of his spine. There was marked tenderness to pressure over the lumbo-sacral joint. Straight leg raising caused pain in the lumbo-sacral area. Neurological examination was negative. The x-ray films showed haziness of the lumbo-sacral articulations. He had a *sciatic scoliosis* secondary to a *traumatic arthritis* of the lumbo-sacral joint. In the stretching under anesthesia snapping sounds were heard in the lumbar area, due evidently to tearing of adhesions about the vertebrae or in the lumbar muscles or both. He was completely cured.

Case 7. Harry S., 35 years old, had pain in the left side of the lower back and left buttock. His pain began 6 months previously without any known cause but was aggravated recently when he lifted a friend of his in a playful wrestling match. The pain began along the left iliac crest and radiated down the back of the thigh and leg. He had also numbness along the outer border of his foot. His body was inclined to the right. There was marked spasm of his back muscles and the spinal motions were restricted. There was tenderness along the left iliac crest and the substance of the gluteus medius muscle, in the lumbo-sacral area and the back of the left calf. The left Achilles reflex was absent. There was one inch atrophy of the left thigh. Straight leg raising on the left side was limited and painful, but was free on the right side. X-ray and neurologic examinations were nega-

tive. This man had a *right sciatic scoliosis* secondary to a myalgia of the *left gluteus medius muscle* and a *sprain* of the *lumbo-sacral joint*. He was cured by a stretching.

Etiology and Pathology

Sciatic scoliosis is a condition which affects the vigorous, muscular, very active individuals. I have never seen this lesion in the debilitated. It is most frequently found in people of middle age. An analysis of the age incidence in our group of 50 cases gave the following results:

Ages	18 to 57 Years	Percent- age
Second decade	2	4
Third decade	8	16
Fourth decade	19	38
Fifth decade	12	24
Sixth decade	6	12
Unmentioned	3 adults	

From these figures it is seen that 78 per cent of the cases were between 20 and 50 years old. The largest number are about 40 years of age. A further analysis shows that there were 13 females, or 26 per cent and 37 males, or 74 per cent. The women were sturdy, strong, active individuals with but one exception. This was a young woman who had an inactive pulmonary tuberculosis. She was a small person but well proportioned, looked well and was doing all of her own housework.

Occupation. The greatest number of females (9) were housewives. One was a business woman. The occupation of the others was not mentioned. Amongst the males the following types of employment were found: Foreman, iron worker, piano mover, waiter, tailor, laborer, presser, cook, cutter, chauffeur, theatre manager, postoffice clerk and social service worker. Thus there is no single or group of occupations that specifically predisposes an individual to sciatic scoliosis.

Trauma in some form is mentioned frequently. The degree of the lesion is not always proportionate to the extent of the injury. The injury is always of the indirect variety and never direct as a blow. Most often the history given is that the patient lifted some object, light or heavy, which was followed immediately by backache and some time later by the whole group of symptoms of sciatic scoliosis. Some of the most severe cases of sciatic scoliosis have followed such simple actions as rising from the stooped position after lifting a piece of paper from the

floor, washing, or reaching to the opposite side of a table. A mild backache left untreated may get worse and finally become marked enough to initiate a sciatic scoliosis. Several seemingly slight strains of the back may, by cumulative effect, give rise to a sciatic scoliosis. In a fair percentage of the cases the onset is insidious and without any recognizable cause. This is particularly true of the primary sciaticas.

Pathology. There are several definite lesions of the lower back which may give rise to sciatic scoliosis. The most common cause is an acute or chronic sprain of the sacro-iliac, lumbo-sacral or lumbar vertebral articulations. An arthritis of any of these joints is a less frequent cause. The diagnosis of arthritis is made from the x-ray appearance. When the films show a haziness or some irregularity of the articular surfaces, it is assumed that the joint is involved. Actually even in the cases of so-called arthritis, it is probable that the symptoms arise from an acute synovitis, because the treatment causes a complete disappearance of the symptoms in a comparatively brief period; whereas, if the arthritis itself was responsible for the deformity, it would not be relieved so readily. I had on my service at the Hospital for Joint Diseases a man with a very severe and typical case of sciatic scoliosis that followed a fall during dancing. He had pain and tenderness over one sacro-iliac joint. An x-ray picture of the pelvis showed haziness of the affected sacro-iliac joint. With appropriate treatment he was cured. At the end of the treatment an x-ray picture showed that both sacro-iliac joints were equally clear. The haziness of the injured sacro-iliac joint, due to either an effusion into the joint, hemorrhage about it or both, had disappeared. In over half the cases of sacro-iliac derangement causing sciatic scoliosis there is sciatic pain with or without atrophy of the thigh and diminution or absence of the Achilles reflex. There is evidently an involvement of the sciatic nerve. If one studies the anatomy of the pelvis and arrangement of the lumbar plexus of nerves, it will be noted that the lumbo-sacral cord passes down in front of the sacro-iliac joint. A cross section of this joint shows that its articular surfaces are no more than about one-eighth of an inch behind the anterior surface of the sacrum and the pelvic wall. In other words, the sacro-iliac joint is very close

to the lumbo-sacral cord. Consequently it is likely that the lumbo-sacral cord may become involved in the pathologic state of the adjacent joints. When, following an injury, there is a sprain of the sacro-iliac joint, the resultant swelling probably extends to the lumbo-sacral cord and by direct pressure disturbs its function. This theory of the origin of the sciatic pain seems plausible because of the proximity of the structures and the disappearance of the sciatica when the joint derangement subsides.

Lesions of the muscles and fascia. There are two types of lesions of the soft parts which may cause sciatic scoliosis, namely, a strain of the muscles or fascia and a toxic myalgia. A strain of the muscles or fascia of the back or buttock may arise from a single injury, as might follow lifting a heavy weight, or repeated less noticeable traumata incidental to laborious work. Some of the fibres of the muscles or fascia are torn. There is an extravasation of blood and the repair is slow. These injuries occur most commonly near to the attachment of the muscles to the bony process. Hence in the back the areas of tenderness are in the vicinity of the lumbar transverse process, and in the buttock they are close to the iliac crest and the sacrum. The diagnosis of strain of a muscle is made from the history of an injury, pain in the muscle on motion, and localized tenderness. In the buttock the gluteus medius is more frequently involved than any of the other muscles. This is often accompanied by sciatic pain which can be explained by the assumption that the sciatic nerve was injured and stretched, producing a perineuritis, or the extravasation of fluid in the injured muscle compressed and irritated the sciatic nerve at its exit from the pelvis. This theory is probably correct but as yet entirely speculative as there is no pathological material available for gross or microscopic study.

There are some cases of sciatic scoliosis in which the essential lesion appears to be a toxic myalgia. The pain and tenderness are limited to the muscles of the back or buttock. The onset is insidious without any evidence of an injury. There may be a focus of infection in the teeth or tonsils or an intestinal stasis, correction of which relieves the pain and deformity. The exact pathology is still undetermined and further study is desirable. The term myofascitis used by Albee is, in my

experience, unwarranted, as there is never any swelling, heat, redness or any of the usual signs of an inflammation. It is important, however, to recognize that a strain of the muscles or fascia of the back and buttock and a condition which, for the time being, we might call toxic myalgia may give rise to sciatic scoliosis.

Sciatica. The pathology of this condition is less well understood than that of any of the other lesions causing sciatic scoliosis. We are certain of the fact that there are some cases of the deformity under discussion that follow sciatic pain. The pain comes on gradually and is followed after some weeks by atrophy of the thigh and rarely of the buttock and a diminution or loss of the Achilles reflex. From the fact that in the resistant cases the pain is relieved by a stretching of the sciatic nerve, I believe that the most likely lesion is a perineuritis with adhesions about the nerve.

Differential Diagnosis

Although the deformity and disability may be marked and the suffering intense, sciatic scoliosis is a relatively simple condition entirely amenable to treatment. Its differentiation from a grave lesion of the back, spinal cord and abdomen depends to a large extent upon a clear and thorough conception of its nature and symptomatology. We must bear in mind that sciatic scoliosis is a lateral deformity of the trunk that arises from an involuntary attempt to relieve oneself of pain in the lower part of the back, or of unilateral sciatica. The basis of the backache is a simple lesion such as a sprain or arthritis of a sacro-iliac or lumbar vertebral joint, a strain of the muscle in the back or buttock, a toxic myalgia of the back or the gluteal muscles or a neuralgia of the sciatic nerve. There is an absence of many clinical and of the roentgenographic signs of a destructive, traumatic or neoplastic disease of the vertebrae and of the salient signs of a spinal cord lesion. Nevertheless, there is enough similarity between sciatic scoliosis and a number of other diseases of the back to warrant some special reflections.

Spinal cord tumor. In a tumor of the cord the pain may have the same character and distribution as in sciatic scoliosis, but there are sensory and motor disturbances, extensive changes in the reflexes, difficulty in the

control of the rectal and vesical sphincters, a cord level of the sensory changes and the results of a spinal tap which serve to definitely establish the diagnosis. In the early stages of a cord tumor the symptoms, however, may be so few and vague that a positive conclusion is not possible. In this connection it may be emphasized that *bilateral* sciatic pain or other neurologic symptoms are strongly suggestive of a cord lesion and are never present in a sciatic scoliosis.

Tuberculosis of the spine. An advanced case of Pott's disease will, of course, not be mistaken for sciatic scoliosis because there is marked deformity of the spine at the level of the disease, there may be a "cold" abscess, and the x-ray film will show a destruction of one or more vertebrae. In the early or less severe cases the deformity may not be readily apparent. But the muscle spasm is continuous, so that the spine is held immobile in all positions of the body. Palpation will reveal a "knuckle" at the level of the disease and the x-ray picture will show some absorption of bone and often the shadow of an abscess about the diseased vertebrae. Syphilis of the vertebrae presents the same picture as tuberculosis.

Tumor of the spine. In the early stages of vertebral neoplasms the x-ray films will show a peculiar haziness and mottling of the body of the vertebra which will be sufficiently odd and unusual to put one on his guard. In the later stages there will be in the cases of metastatic lesion evidences of the primary lesion in some other part of the body, and in all cases the x-ray picture will show unmistakable changes in the vertebrae at the site of pain. In addition the pain of a tumor of the spine is not only severe but peculiarly persistent and not relieved by any change in posture or by ordinary doses of sedatives, while in sciatic scoliosis the pain may be intense, but it may subside spontaneously at different times of the day, or be relieved by the change from one position to another.

Fracture of the spine. In this condition there is localized pain and tenderness and there may be a lateral deviation of the spine simulating sciatic scoliosis, but there is a history of a severe fall or injury, posterior angulation of the spine at the painful area and x-ray changes that leave no doubt about the exact pathology.

Backache is present, of course, in many

other conditions due to general systemic disturbances, gynecologic derangements and genito-urinary diseases, but in all of these a complete physical examination will indicate the proper diagnosis.

Treatment

In undertaking the treatment of a case of sciatic scoliosis it is imperative that a very thorough physical examination be made to establish the fact that there is no organic lesion of the nervous, osseous or genito-urinary systems or the abdominal organs, and to discover, if possible, the existence of some special focus of infection in the teeth, tonsils, intestines or elsewhere. If there is such a lesion, it must, naturally, be attended to. But we should bear in mind that the mere presence of a potential etiological factor, such as an abscessed tooth, does not necessarily explain the sciatic scoliosis. They may be quite independent of each other. The focus of infection should receive treatment, but one ought also to apply the proper physical therapy for the sciatic scoliosis. I am prompted to emphasize this point because I have seen many cases in which diseased teeth and tonsils have been removed, sinuses washed or the prostate massaged without any attention to the back, on the theory that clearing up the supposed focal infection will effect a cure of the painful deformity. The result is very often disappointing. When there is a bony anomaly in the lumbo-sacral area, such as a large transverse lumbar process, a spina bifida occulta, asymmetrical vertebral articulations or a partial sacralization of the last lumbar, one should not conclude that under such circumstances surgery is indispensable. One should recall that these anomalies antedated the appearance of the deformity by many years and that experience has shown that the *bachache* can be cured by non-operative methods.

Cases of sciatic scoliosis may, for convenience, be divided into three groups, mild, moderate and severe. In the mild class there is slight pain, intermittent deformity and little disability. The patient is often not aware of any deformity. The symptoms are readily relieved by simple measures such as strapping of the back with adhesive plaster, physical therapy such as baking, massage and diathermy, and sedatives. Sometimes it is necessary to put the patient to bed for a few days. The vast majority of patients with mild sciatic

scoliosis get well within several weeks. It is well to continue support of the back by a belt for at least a month.

In the moderate group the symptoms are marked, of longer duration and not so readily relieved. In this type while the deformity may be very noticeable when the patient is standing, it disappears when he lies down. The ideal treatment consists of keeping the patient in bed for several weeks, applying physical therapy to him while in bed, and administering sedatives to ease the pain. When the sciatic pain is annoying traction on the limb may give complete relief. Frequently the patient refuses to go to bed because he does not feel ill enough to do so or cannot leave his business or his work. In such instances a plaster of Paris jacket is applied under mild traction in a Sayre halter. In this way the deformity may be completely or almost completely corrected and the back fairly well supported and protected. The jacket should be worn for a month or six weeks and replaced by a canvas belt, a canvas or celluloid corset or light back brace. Physical therapy ought to be given for at least another month and hard work and heavy lifting interdicted for several months. These precautions are necessary because there is a tendency for the symptoms to recur and to be aggravated by an additional even mild trauma. By this method of procedure many of this group get well.

There are some cases of the mild type and many in the moderate group that persist and get worse. Some cases are severe and resistant to treatment from their onset. Some patients of the mild or moderate group are apparently well for weeks and even months, but get worse after an injury, or without an apparent cause. The treatment of the severe type of sciatic scoliosis must be radical. The patient should be hospitalized and subjected to a thorough stretching of his back, and in cases of sciatica, of the sciatic nerve. The chronic cases and those with severe symptoms are resistant because strong adhesions have formed about the vertebrae, the sacro-iliac joints, the sciatic nerve or in the muscles. The adhesions may be present in several localities. To effect a cure it is necessary to break up these adhesions. The routine we adopted some years ago and have been carrying on successfully is the following:

The patient is anaesthetized and placed on a Hawley table. While an assistant manually

fixes the chest the surgeon takes hold of both lower limbs and swings them to one side until he thoroughly flexes the spine to that side. He then moves the limbs to the extreme opposite side. The adhesions in the back are thus completely stretched or torn. One often hears a cracking sound during the manipulation indicating that adhesions have been broken. If there is a sciatica the affected nerve must be stretched. This is accomplished by flexing the limb with the knee extended. The limb is gradually elevated until the foot is brought to within 12 to 15 inches of the face. In this way the sciatic nerve is thoroughly stretched. The lower limbs are then hyperextended, thus stretching the spine further and re-establishing the normal lumbar hollow or lordosis. At the termination of the stretching the body is symmetrical and the physiological antero-posterior curve of the spine is normal. All adhesions have been broken up or stretched and the sacro-iliac joint brought to a normal state. The latter, although a vague expression, is true, for in the cases of sciatic scoliosis secondary to a derangement of the sacro-iliac joint, there is no pain or tenderness in this joint after the stretching.

When the stretching is completed and while the patient is still under the anesthetic a plaster of Paris spica-jacket is applied. With the lower limbs in hyperextension the body is enveloped in sheet cotton or table felt. A large pad is placed over the lumbar area to maintain the lordosis. A plaster jacket is then applied. When the plaster has hardened sufficiently the lower limbs are brought up to normal alignment with the trunk, and the plaster dressing is continued down the affected side to the toes. When completed the support extends from the nipple line down to the toes on the painful side and immobilizes the back and the leg.

The bed on which the patient is to lie is made rigid by placing a fracture board between the spring and the mattress. The head of the bed is elevated on blocks 15 inches high. This position is more comfortable than that of lying absolutely flat, and enables the patient to look about the room and see what is going on. This detail is essential to the well being of a person who has no pain and must stay on his back for several weeks. A large window should be cut out of the plaster over the abdomen because there is usually

some abdominal discomfort due to distention. The distention is probably due to the effect of the stretching on the splanchnic sympathetic nerves. It lasts 2 to 4 days and, while never serious, it may be annoying. Two or three times a day the patient must be turned on his face so as to relieve pressure from the back and prevent pressure sores. The change of position is very welcome to the patient.

It is remarkable how well these patients feel after the stretching. The old pain is gone and there is a sense of relief from what has usually been a long standing distressing condition. The postoperative treatment is fully as important as the technic of the stretching. On the basis of experience it is necessary to continue the immobilization and rest in the plaster for at least three weeks. The plaster is then removed and measurements taken for a Knight spinal brace. During the next week or preferably ten days the patient is allowed to lie in bed without support. Baking and massage to the back and leg are given twice a day. A series of gradually increasing exercises for the back and legs is outlined. On the first day the patient rolls over on his face several times. He moves his ankles, knees and hips. On the following day while lying prone he arches his back several times. In the course of the next few days he arches his back more, elevates the affected leg from the bed and increases all of his movements. At the end of a week he is ready and able to sit up. The brace is applied and he is permitted to sit out of bed for a half hour. He is from then on encouraged to walk about and may go home. The brace should be worn during the day for a month or two. At the end of a month he can resume light work and is usually ready at the end of three months to go without support and return to full duty.

In my own experience the treatment just described has cured every case of *genuine* sciatic scoliosis. In a few cases, notably those due to severe sciaticas, there may be slight residual discomfort after the removal of the plaster. This usually disappears after a fortnight of physical therapy. In this type of case I am now inclined to prolong the period of immobilization to five weeks. I wish to emphasize that a simple stretching without immobilization is not usually effective. I have seen several failures in the hands of others from such treatment. Evidently a period of complete rest is indispensable to a cure. I

have had several failures due to a lack of accurate diagnosis. All these cases turned out to be cord tumors in which the symptoms were very vague. I reported these in an article I published last December. Such errors cannot be altogether avoided, but we can at least be on our guard and will in this way reduce their number.

Summary

Sciatic scoliosis is a painful lateral deformity of the back. It follows painful but simple lesions of the sacro-iliac joints, the vertebral articulations, lesions of the muscles and fascia of the lower back and the buttock and sciatic neuralgia. It does not include and must be carefully differentiated from a lateral deformity of the trunk due to a gynecologic, genito-urinary, neurologic or vertebral lesion. In the care of a case of sciatic scoliosis it is very important to identify by careful physical examination the exact tissues involved, since only in this way can the therapy be intelligently and effectively applied. The mild and moderate cases can be relieved by conservative measures. The severe cases require thorough stretching under anaesthesia followed by extensive immobilization of the trunk and the lower limb on the affected side. It is a great satisfaction to know that even the severest case of sciatic scoliosis can be cured.

Discussion

Dr. F. H. Ewerhardt (St. Louis, Missouri): Those of us who are interested in orthopedic surgery are well aware of the various points brought out by Dr. Kleinberg and appreciate the emphasis placed upon them. The subject is of tremendous scope but it has been presented in as concise and rounded out form as is possible. It is apparent that the essayist is complete master of his subject. I was particularly interested in what was said in regard to the value of stretching. I can corroborate his statements in regard to the real value of proper manipulation and stretching in these cases.

I have had quite a number of similar cases during these past years. In my earlier years I was very often greatly confused just what to do with such patients if after the regular procedure I still found them not well. At first I used to put straps on the patient. Later on, if this didn't succeed, I would put the patient in a plaster jacket, following that later with physiotherapy. Even then sometimes months would pass before the patient was completely relieved of his symptoms. More recently, I have adopted the stretching procedure, and I am glad to say that I am able to report that the majority of the cases have responded very happily.

I recall at this moment a woman who came

to me within the past twelve months. She was walking with the typical gait described by the essayist, only there was more of a forward bending. Examination did not reveal any pathology, and we concluded that it was sacro-sciatic trauma. I placed this lady on a table and manipulated the right and the left leg. By manipulation I mean that we tried to place the limb in the various normal positions the limb can be placed in. This was followed by a strapping of the back in the regular prescribed way. When she came back the next morning I was gratified to find that she was very much improved.

I cite this experience in order to show that manipulation will often bring about a definite amount of relief and will restore function to the back and leg. In this case the woman was able to go back home inside of a week. She didn't need prolonged immobilization. This does not mean that all cases could be treated in the same manner, but it does mean that sometimes a case that looks quite severe can be treated very successfully by just a moderate amount of immobilization.

There is another type of case that comes to our attention in which I have had considerable success. Manipulation was resorted to in the form of rhythmical stretching. I almost hesitate to mention it for fear I may be classified as an undesirable citizen in the practice of medicine, but nevertheless it is a fact that this type of case has been helped by rhythmical stretching. We place these patients between the stretching machine, attaching the limbs to the machine on one end and the upper part of the body to the other end. The machine is set in motion and it can be regulated so that the strain or stress is equal. It may be 50, 80 or 100 pound pull and the body or part is stretched an inch or more at each pull. It is a form of passive stretching manipulation which is rhythmical in quality. We place the patient on this apparatus and stretch the body perhaps for two or three minutes.

I should like to ask Dr. Kleinberg whether it would not be better to omit in general the severe manipulation and complete immobilization that he advocates for the less severe and ambulatory method by resorting to the mild rhythmical stretching form of treatment. I am wondering whether he approves of that sort of thing.

In these cases after we have found that the patient can get by, his back being comfortable, we are prone to put him on certain forms of movement. I hesitate to call them exercises as I don't like to be misunderstood on that. The patients are given certain rhythmical movements with a view of attempting at least to restore a broken coordination of the hip girdle muscles. I am inclined to think that following a slight trauma there is an incoordination of the lower back muscles and unless we restore that coordination there is apt to be a recurrence. We therefore place these patients on rhythmical movements and have found that that helps them a great deal.

Dr. Kleinberg, closing: I have nothing to add because I have had no experience with the use of rhythmical movements at all.

ELECTROTHERMIC EXTIRPATION OF TONSILS *

The End Results With a Newer Technique

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In demonstrating the end results in a group of cases of electrosurgical tonsillectomy, it will become apparent that the conflicting views of the efficacy of this method are based upon an antiquated technique. The opinions of investigators like McKenzie of England,¹ Skillern,² Clark,³ and Portmann of Bordeaux,⁴ are substantiated by the postoperative findings in these patients. McKenzie emphatically stated his conviction that electrocoagulation would eventually be the method of choice for the removal of tonsils in adults.

In view of the fact that opinions are so divergent it appeared timely to analyze my seven years' experience with a gradually changing technique. By elucidating the methods for successful electrotrophic extirpation of tonsils and by taking note of the causes of failure it may be possible to clarify a new subject which has been shrouded by ignorance and misunderstanding.

Modern medicine emphatically supports the principle of eradicating all foci of infection. A tonsil as the possible focus of infection may be either conservatively treated, or radically removed, depending upon the existing indications. Electrosurgery opportunely comes to our aid here and enables us to either treat in moderation by "Electrocryptectomy," or to totally extirpate the infected nodes.

It is now definitely established that electrocoagulation is the most efficient method in the electrotrophic extirpation of tonsils. The rapidity of removal by electrocoagulation is controlled only by the severity of the postoperative reaction. Postoperative bleeding is now made negligible by avoiding the cleanly defined line of hyalinization as described by Clark, Morgan,⁵ and Asnis.⁶ The following technique avoids the sloughing off of large masses of tissue and so minimizes the possibility of postoperative hemorrhage.

Newer Technique

I shall briefly describe to you the principles of our technic. The tonsils are first cleaned of all accumulated mucus and detritus. The McCauliffe, Jr., "Tonsil Aspirator" is ideal for this purpose. In the hypertrophied, polycryptic variety, the crypts are sprayed with an astringent antiseptic solution before and after the removal of all inspissated pus and concretions. Under the name of "Liquor Coagulans," the author has found the following solution (put up by the Modern Pharmaceutical Co., N. Y.) efficacious in agglutinating the mucus and debris and in later assisting in the separation of the mummified and hyalinized tonsillar tissue.

Formula of Spray and Gargle

Rx

Menthol (Modified)	1.0
Thymol	1.5
Potassii Sulph.	8.0
Acid Salicylic	4.0
Zinci Sulphonate	5.0
Alum	3.0
Aromol	2.0
Glycopon, s. s.	150.0
Modern Aromatic	5.0
Ol. Gaultheria	5.0
Glycerin	60.0
Alcoholis	150.0
Aqua dest., q. s.	1000.0

A two per cent solution of Butyn is then sprayed over the tonsil and at the base of the tongue and pharynx, instructing the patient to hold the solution for one minute before expectoration. The gagging reflex should now be normally obliterated. In the exceptionally sensitive throat, topical application of a ten per cent cocaine and one per cent ephedrine solution may be required. Restrict local anesthesia to a minimum. A special electrode, consisting of a hinged plate or collar, three inches by six inches, is placed on the anterior aspect of the neck and held in place by a suitable elastic attachment. The indifferent

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** This and the succeeding two papers were presented as a symposium before the New York Physical Therapy Society, Dec. 3, 1930.

terminal of the high frequency machine is attached to this electrode. The active electrode consists of an insulated, curved needle which is bare only at its distal end for one-quarter of an inch. A special bakelite coating over the ordinary rubber covering is necessary for the correct working of this technique. The machine of choice for this method is one capable of delivering the coagulating, desiccating and cutting currents. The biterminal (d'Arsonval) current is first applied to the middle of the tonsil by inserting the needle to the length of one-eighth of an inch and thus coagulating visibly a circumferential area which becomes snow white but never charred. The amount of current to be used varies with the individual case. The average current required for total coagulation is about 450 milliamperes applied for 2 seconds.

We have noted that as high as 650 milliamperes may remove one-third to one-half of the highly vascular and lymphatic tonsil. We have also noted that some patients may take as much as 800 milliamperes without squirming. The amount of current used is only exemplary. The milliamperemeter on a machine indicates the measurement of the current for that particular machine. An Ohmmeter may be used to exactly measure the amount of current delivered by the machine, it being substituted for the patient in the circuit. For example: a reading on the milliamperemeter with the Ohmmeter in circuit of 2500 milliamperes is equivalent to a reading of 350 milliamperes when the patient is in circuit. We thus avoid short circuiting of the machine with possible damage to the delicate meter. Repeating the coagulation process, using the crypts where possible to an eighth of an inch of the superior and inferior poles and carefully avoiding both the anterior and the posterior pillars (employing a special hard rubber retractor for the small hidden tonsils) we continue until the entire surface of the tonsil is blanched white. The metal electrode or collar, is then removed from the neck, and the monopolar (Oudin) or desiccating current is applied just deeper to the coagulated tonsillar area. It is important to note that the patient definitely feels a penetrating heat when desiccation is being accomplished. Otherwise, the current becomes damped on inserting the needle into the depths of the tonsillar tissue and no action ensues. Finally, the surface is completely dehydrated and the

lymphatics and superficial vessels sealed by fulguration. A spark about two millimeters in length is played directly on the previously coagulated and desiccated tonsil until all oozing and moisture disappear. The patient will now usually note that practically all pain is gone. The discomfort of coagulation seems to be neutralized by the dehydration process of deep and superficial desiccation. The throat is then again thoroughly sprayed, terminating the procedure always by nebulizing the mucous membrane with a bland aromatic oil.

The patient is instructed to gently gargle twice daily with the Liquor Coagulans in the weekly interim between treatments. One tablespoonful of gargle solution is diluted with an equal amount of cold water for average use. Special anesthetic lozenges are usually prescribed for the mild sore throat which follows each treatment. A tablet dissolved on the tongue prior to treatment aids in abetting the gag reflex.

Discussion of Cases

The following case reports illustrate the superiority of electrosurgical tonsillectomy over the orthodox method in the presence of certain systemic diseases:

Type 1—Hemophilia or Blood Dyscrasias.

About fifteen per cent of my cases fall into this category:

Patient—A boy, aged six years, had been frail and undernourished since infancy. At birth circumcision required suturing on account of profuse bleeding. Ecchymosis resulted on slightest bruise. Hemoglobin 65 per cent. Clotting time markedly delayed. Tonsillectomy advised for several years on account of mouth breathing due to hypertrophied and diseased tonsils and adenoids. Parents feared that the child might bleed to death and so procrastinated about operative intervention. Electrosurgical removal of tonsils and adenoids was accomplished in fourteen treatments by desiccation and fulguration combined. Only anesthesia used was two per cent Butyn, sprayed on faucial tonsils and retro nasally with Silvers' modification of De Vilbiss No. 56 post-nasal syringe. No bleeding noted during entire period of electrosurgical tonsillectomy and adenoidectomy in this case of hemophilia.

Patient—Physician. Age 44 years; advised tonsillectomy over twenty years before. On account of plethoric constitution and difficulty in stopping hemorrhage in minor trauma the doctor has always feared the radical cutting operation. Tonsils enormously hypertrophied, polycryptic and of the highly vascular variety. With no untoward reaction patient attending to his

large general practice daily, gradual extirpation was effected by the newer technique.

Patient—A woman, aged 31 years, delayed coagulation time; bled freely on slightest trauma. Had infantile paralysis at six years. For the past seven years has noted progressive enlargement of cervical lymph nodes on left side. Large matted mass in region of left tonsillar node the size of small lemon. Markedly hypertrophied and diseased tonsils. Refused surgical tonsillectomy by many laryngologists who undoubtedly suspected tubercular lymph nodes. Definite recession in size of mass followed a profuse discharge of foul smelling pus and blood subsequent to first treatment. Cutting current employed here to incise abscessed tonsil. Coagulation and desiccation was supplemented by fulguration in final stage of tonsillectomy. Fulguration required to obviate bleeding.

Type 2—Senility with general debility, usually accompanied by chronic progressive auditory changes and deafness of varying degree. This type of case constitutes about ten per cent of those treated in our series.

Patient—Woman, age 57 years; weight 142 pounds; B. P. 160/95. Complaining of paresthesia of sensory nerves of tongue. Advised by diagnostician after careful examination that all he could find wrong with her was her large, diseased tonsils, advising tonsillectomy at once. We began tonsil desiccation in October, 1924. No coagulation was used at that time and tonsils were merely shrunken in situ. The infection in the crypts was cleaned up, the lymphoid-tissue converted to a fibrous stump and the patient has enjoyed perfect health since. She was examined just one week ago and showed no signs or symptoms referable to her throat, although the fibrous tonsillar stumps were still clearly visible.

Patient—Woman, aged 55 years; weight 155 pounds, B. P. 98/60, Hemoglobin 60 per cent. Markedly enlarged polycytic and diseased tonsils. Advised tonsillectomy many years ago but refused on account of general debility and secondary anemia. Tonsils extirpated by coagulation, desiccation and cutting current. Fulguration used in terminal stage when crypts had been completely exenterated by the coagulating and cutting current.

Type 3—Cardio-Renal (Hypertension). These cases common and form about twenty per cent of the series. The following are typical of this class:

Patient—Mrs. W. F., thin and undernourished, age 56 years; weight 143 pounds; B. P. 235/140; height 5 feet 10 inches. Chronic Interstitial Nephritis: Hypertension for many years. Recent retinal hemorrhage right eye. Ophthalmoscopic examination revealed marked tortuosity of retinal vessels of both eyes with old hem-

orrhagic retinitis causing a marked amblyopia of right eye. Patient was told that she had a kidney condition which was probably due to her infected tonsils. Tonsils oozed pus on slightest pressure. Fauces first cleaned up thoroughly with antiseptic and astringent sprays and pus expressed from crypts. Light coagulation began with 250 milliamperes current. Heavy deep desiccation and no fulguration used as the latter might seal the crypts. Endotherm knife used to open up each crypt and permit free drainage. After third treatment patient's blood pressure dropped to 198/135 and she showed definite clinical signs of improvement. On the sixth treatment (third treatment to each tonsil) the blood pressure dropped still further to 188/125. Especially significant being the diastolic drop. No more headaches or other symptoms of pressure were noted after sixth treatment. No shock was sustained by patient from start to finish of tonsillectomy. Just two per cent Butyn used as spray to throat for inhibition of gagging reflex. Here fulguration was contraindicated, while the cutting current was a necessary adjunct for opening up the deeply diseased crypts.

Patient—Dentist, aged 69 years; Angina Pectoris of nervous origin for the past eight years; bilateral sympathetomy five years ago; sixteen exposures to x-ray in the hands of one of our most prominent pathologists; fibrosis of tonsil evident but two large crypts discharging pus still present. Electrosurgical procedure necessary to totally remove focus of infection, avoiding shock and hemorrhage.

Type 4—Those having markedly hypertrophied and diseased tonsils, fearing and refusing the orthodox operation. This type forms about fifty per cent of this series.

Patient—F. S., male, aged 20 years. Frequent tonsillitis usually lasting weeks at a time and causing complete incapacitation. Markedly enlarged and cryptic tonsils, full of pus. Abscess in center of left tonsil. Last attack of tonsillitis two weeks ago. Throat thoroughly cleansed with astringent and antiseptic sprays. Endothermy or cutting current used on second treatment only, as first treatment was moderate, with dose of 250 milliamperes of bipolar current. When opened by cutting current under topical five per cent Butyn Ephedrine solution a large amount of inspissated pus was expressed from left tonsil. Patient noted immediate relief and expectorated large quantities of foul smelling pus and clotted blood. Electrocoagulation was then instituted using as much as 550 milliamperes on the large spongy tonsil for one second exposure to the needle. Patient had a mild reaction for forty-eight hours. No bleeding nor interference with regular partaking of meals.

Patient—Rev. P. S., a cantor by profession and therefore requiring the use of his voice regularly, is another case typifying the advantages of this controllable method of tonsillectomy. Patient had no interference whatever with his vocal efforts, and as a matter of fact stated that he could sing with greater ease after the third treatment.

Type 5—Diabetes.

Patient—Mrs. F. F., age 37 years, Diabetes five years; Blood Sugar 249 mg.; Urine Sugar up to 7 per cent; swallowed two tablets bichloride mercury accidentally in 1928 which left her with a resultant chronic interstitial nephritis in spite of early gastric lavage. Large diseased and polycryptic tonsils shrunken *in situ* by desiccation. Deep bipolar endothermy purposely avoided as sloughing might become too extensive, as a high blood sugar was ever present even under a strict dietary regime. Patient received insulin treatment for two weeks prior to tonsil operation. No sloughing or bleeding noted. Marked improvement in general condition noted after fibrosis of tonsils.

Comment

The method of choice for the treatment of the young cardiac, tuberculous or nephritic patient is by gradual extirpation by means of careful dissection with constant visibility of amount of coagulation being done to each tonsil.

No loss of time from work is noted in the vast majority of the most involved cases. Electrodesiccation is usually employed to finish up the fibrous tonsillar tab left after partial coagulation. Sometimes an adherent fibrous tonsil will require freeing from the anterior pillar by means of the endotherm knife or cutting current. At other times a large tonsil will require the trimming of the *Plica Triangularis* which may obscure from view the deep fossa left by the coagulation process. The specialist familiar only with surgical tonsillectomy will criticize such results because he notes that the anterior pillars are intact and that the plica is untouched. This lack of mutilation, of course, rarely attends the orthodox surgical operation. Surgical diathermy enables us to remove only that which is detrimental, rapidly or slowly, depending entirely on the desires of the patient, and the indications at hand; and with the proper technic it makes a bloodless, almost painless, and absolutely safe procedure out of one that has too often, unfortunately, proved otherwise.

Summary and Conclusions

Electrothermic technique has a definite place in rhinolaryngology.

The advantages of electrosurgical methods are:

1. Complete control of operative procedure from start to finish.
2. Complete absence of shock and pain under 2 per cent Butyn Spray topically.
3. The entire process of tonsillar extirpation may be accomplished in any desired number of treatments.
4. No hemorrhage, negligible bleeding if present in Hemophilia.
5. Sterilization of tonsils *in situ* prior to removal.
6. No incapacitation is the rule.
7. No interference with deglutition; eat directly after treatment.
8. Avoidance of general or infiltration anesthesia.
9. No untoward reactions or complications. (The author has met with none in his seven years' experience with this technique.)
10. No postoperative traumatic changes:

No scar tissue formation. No palatal deformities due to binding down of pillars by contraction of cicatricial tissue. No damage to aponeurotic lining with obliteration of the tonsillar fossa by granulation tissue. NO CHANGES IN THE VOICE.

11. Marked gain in weight usually accompanies endothermic tonsillectomy.

The disadvantages of the electrosurgical technic are:

1. The time required for safely controlled and complete extirpation.
2. The time and the effort required by the operator in mastering the correct technic.

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ENUCLEATION OF TONSILS BY THE ELECTRIC CUTTING CURRENT

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In the arch formed by the palatal pillars two comparatively small masses of lymphoid tissue are placed the functions of which in the human economy have long been the subject of study and ardent controversy.

Despite the enormous literature which has been piling up within the past 25 or 30 years unanimity of opinion can hardly be said to have been approached on the question. Tonsils being so easily accessible, and symptoms arising from them so immediately recognizable, it is not strange that they were the object of remedial efforts even before the earliest recorded medicine. As early as the Hippocratic era it is certain that procedures affecting these glands had become definitely established and finger avulsion practiced. In medieval times a varied armamentarium had attained a venerable and traditional use.

Among the early procedures in the present era when tonsillotomy was the operation of choice, was the galvanocautery. The purpose was not to remove the tonsil but to destroy the crypts.

While very often satisfactory results were obtained, the modern conception of focal infection has rendered obsolete any procedure which does not completely eradicate the focus of infection. As a result an untold number of methods and instruments have been devised to accomplish this purpose. The accidents of these operations and the morbidity following them, infrequent though they are, when the large number of cases operated upon by all types of operators is considered, has stimulated further the search for safe and effective methods.

What then do we require of a tonsil operation?

The ideal sought is a throat in which the normal mobility and relations of the pillars, palatal structures and tongue, is maintained with complete removal of all the lymphoid tissue in the sinus tonsillaris with the minimum of scarring. Such a result is obtained by avoiding injury of the tissues beneath the aponeurotic fascia either at the time of operation or by secondary necrosis.

A proper knowledge of the anatomy of not only the tonsil itself but of all adjacent structures is fundamentally necessary. The limits of time do not permit me to go fully into the subject nor yet to emphasize the surgical implications incident to any operative work in this region. Suffice it to say that one cannot hope to get uniformly favorable results without being fully cognizant of every physiological and anatomical factor.

A proper and complete knowledge of the anatomy of the tonsil is no less important in the electrical removal than it is in any other surgical procedure of the tonsil. This is particularly true when it is realized how much more of the structures may be affected than those immediately in contact with the parts of the instrument when the electric current is conveyed through it.

By far the most frequent accident of the tonsil operation is hemorrhage. The types of hemorrhage I shall not consider are those due to the blood dyscrasias such as hemophilia, purpura, leukemia, et cetera, nor those due to systemic diseases such as diabetes, in which there is decreased blood coagulability.

If, during the enucleation of the tonsil, we confine our instrumentation to tonsil tissue without traumatizing the tissues of the sinus tonsillaris, the possibilities of hemorrhage are very greatly minimized. We are less likely to encounter larger vessels which pass beneath the dense fascial sheath which lines the sinus tonsillaris and serves to envelop the muscularis. In enucleation of the tonsil by the electric current it is highly important that the length of exposure be as short as possible.

The method of tonsillectomy I shall here briefly describe was devised a number of years ago to combine the advantages of the guillotine operation with those of the snare. The result was an instrument which made possible a snare operation without preliminary dissection. It had also the added advantage of preventing the inclusion in the snare of any structure other than the tonsil.*

* The snaretome operation for enucleation of the tonsil. *Transactions of Section in Laryngology, Rhinology and Otology*, p. 166. 1918.

Furthermore, the ring aperture by its apposition against the bony resistance of the mandibular eminence flattens out the sinus tonsillaris so that the tonsil now becomes a protuberance on a flat fascial surface. This effected a separation of the tonsil from the fascial attachment and emphasized the line of cleavage between the tonsil and fascia through the loose connective tissue areola.

In the areolar tonsillar membrane the blood vessels have the least support and when crushed in this plane, the crushed intima coat of the vessels invert readily into the lumina and so diminish bleeding. When cut across in the fascial or muscular planes the vessel walls have a tendency to be kept open by retraction of the muscular or thicker fascial fibres. More recently the electrical cutting current was adapted to the procedure. The cutting current further seals the vessels with a fine coagulum.

The closing dull blade now grips the thinned out tonsil pedicle containing areolar connective tissue and mucous membrane only. Only the mucous membrane covering the tonsil itself is included in the guillotine, leaving intact the reflection of mucosa around the anterior pillar. The guillotine having served its purpose of delineating the line of cleavage, and the snare having safely encircled the pedicle, the blade is released, the guillotine automatically detaching itself and the tonsil pedicle remaining firmly gripped in the snare. With the completion of the snaring the result is a smooth untraumatized fascial surface from which the tonsil has been ablated without any manipulation of the tissues of the sinus tonsillaris. The Snaretome has been modified for the use of the electric current in no way except that three inches of the canular end of the snare has been insulated with rubber tubing and that in place of piano wire a fine annealed nichrome wire 35 gauge is used which can do no mechanical cutting, but which depends upon the surgical current to complete the severance of the pedicle. The amount of current and the time taken is very short, but the compressed tonsil pedicle contains only a very small amount of tissue which is very easily severed by the cutting current.

Prolongations of lymphoid tissue extending from the plicae to the base of the tongue are readily coagulated under full control with a

bipolar electrode and heal smoothly and completely without any complications.

The Snaretome is operated from a low voltage-high frequency spark gap machine, discharging 50,000 to 80,000 sparks per second, which in the oscillating circuit produces undamped high frequency oscillations. In order that the cut may be smooth and fast, producing very little coagulation the frequency of the oscillation given out by the spark gap must be very high.

In the machine I am using, the oscillating circuits are perfectly synchronized, shock proof to the patient or operator, and have the special advantage of allowing a continuous step-less regulation of the energy applied to the electrodes or patient from zero to its maximum of 6,000 milliamperes.

Operation of Machine: The selector switch is set for cutting and coagulation. The dial of the step-less control is set at 85. The calibrated spark gap control is set at 2. The main switch is set for "ON" and controlled by a foot switch. This setting will prove about 1200 milliamperes. If general anesthesia is used, the indifferent block tin electrode measuring about 60 square inches in size is connected to the indifferent pole of the high frequency machine through a conducting wire which is placed on the patient in the usual way. Under local anesthesia a spring jawed arm clamp may be used as an indifferent electrode. The active electrode connected to the medium voltage pole of the high frequency machine through a conducting wire is fastened by means of a clip to the snare.

The indifferent electrode must be in complete contact with the skin throughout the entire surface to prevent burns. The active electrode is connected to the snare when the pedicle has been securely gripped in the snare loop and the current turned on by means of a foot switch operated by the surgeon who thereby has complete control of the technic. No further precautions need be taken than the insulation of the operator with rubber gloves and avoiding touching of any metal instrument to the uninsulated portion of the snare while the current is passing through the snare.

Hemorrhage is entirely obviated, and when properly selected cases have been operated on, the slough is practically absent. Technic is in all respects exactly similar to the Snare-

tome operation with the exception that instead of completing the severance of the pedicle with the travel screw the cutting current is used for the same purpose. This operation is quick, painless, free from immediate hemorrhage in the large majority of cases. When occasionally there is slight bleeding it is readily controlled by an electrode or by a hemostat forceps grasping the bleeding point and the active electrode applied to the forceps.

The removed tonsil on examination shows it to be soft and the areolar capsule shiny and smooth and hardly distinguishable from a tonsil removed by the cold snare. The areolar capsule can be lifted from the tonsil and is elastic showing that the areolar fascia also is not coagulated. Examination of the sinus tonsillaris shows it smooth and the glistening fibrous tissue uncooked in appearance the fascial striae being distinctly observed. Except for a white line at the margin of the musoca indicating where the current cut through the infolded mucosal lining, the pillar edge is intact and untraumatized. This operation can be done either under general or local anesthesia.

When the operation is done under ether narcosis another factor must be taken into consideration. Before the current is passed through the snare, ether must be discontinued

and all ether containers removed from the immediate proximity of the operative field. The current must not be applied until one minute after ether administration has been discontinued and the concentrated ether vapor dissipated. This obviates any danger of ignition.

The more careful the technic of preparation in both instances the more gratifying the results. The indications for the use of this method are the same as for any tonsillectomy. Enucleation by this method must not however be used in those cases where the usual method would be dangerous, as in hemophilia, purpura, leukemia, etc. Very severe secondary hemorrhage may take place in these cases. Furthermore, where there has been scar tissue formation from repeated peritonsillar abscess, chronic tonsillitis, etc., this method should not be used because the current must be exhibited for a longer period causing coagulation in the peritonsillar tissues, with consequent necrosis and sloughing of these structures. To a greater or lesser degree healing is delayed as a result.

The end results are comparable with those in the best snaretome operation. The pillars are intact, pliable, mobile as is also the tongue. All tonsillar tissue is removed with very little scar tissue.

ELECTROCOAGULATION OF TONSILS WITH SPECIAL REFERENCE TO TECHNIC

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Three and one-half years of employing electrocoagulation for the removal of tonsils has convinced me of the merit of this procedure in the hands of those trained in its use. This method is now assuming its rightful place in the field of classical surgery with the laryngological group. It should, however, be mentioned that electrocoagulation in no wise replaces orthodox surgery for the general run of patients who require tonsillectomy. My work has been confined entirely to that selected group of patients for whom radical surgery was contraindicated. The very debilitated, the aged, the tuberculous, the hemophiliac, and those with serious heart and kidney involvements, are usually recog-

nized by the laryngologist as the types of cases for which conservative surgery is preferable. It is with this group that tonsillectomy by electrocoagulation should prove the method of choice. Nor can we overlook that vast and ever-growing group who, even when a tonsillectomy is imperative, will reject the usual surgical procedure, but who will readily submit to having their tonsils removed by electrocoagulation.

A complete analysis and review of the clinical results obtained in my cases in the removal of tonsils by this method, supports in every instance, the findings of other laryngologists who have employed a similar procedure. Electrocoagulation effects a complete

removal of all tonsillar tissue with its accompanying infection. When correct technic is employed the end-results are comparable to those of orthodox tonsillectomy, leaving a perfectly smooth, soft, pliable fossa; the preservation of the normal contours of the muscles of the throat; and the absence of trauma and its resultant thickening of these structures.

It is notable to mention that in a few cases there is a tendency toward improvement in the general physical condition of the patient immediately following the initial treatment of the tonsils. In the management of acute and chronic diseases in which the tonsils act as foci of infection, electrocoagulation has proved itself an ideal procedure.

Skilern of the Post Graduate Hospital of the University of Pennsylvania, reports in connection with his research on the electrocoagulation of tonsils, "In those cases that have received two or more treatments, I found that the heat necessary to destroy the tonsillar tissue had to all appearances, destroyed the infecting organisms within the depths of the crypts", and second, "The bisection of the enucleated tonsil showed the cells below the destructive line to present a normal picture, and it was also gratifying to note the constitutional improvement in these cases after the second treatment".

My own observations in this connection have been further supported by Portmann, Moreau, Hoffendal, Poyet, Bourgeois, Dillinger, Sponsler, Palen, Fetterolf and others, all of whom have already reported their results with the electrocoagulation method for the removal of tonsils.

Dr. Dan Mackenzie in a report of his findings of diathermy coagulation states that "it destroys the bacteria sepsis in the tissue adjoining the field of operation".

Generally speaking, up until this time, I have confined my work almost entirely to following the same technique as was originally contributed by Dillinger, and which has been followed with little or no variation by all laryngologists who have attained a sufficient degree of perfection to justify reporting their results. It has not been established that the variation from this original technic, such as employing desiccation or fulguration, is productive of any better end-results, and that, further, there is a grave likelihood of superimposing a scar formation over the remaining

undestroyed lymphoid tissue as a result of utilizing heavy discharges of monopolar current either superficially or within the tonsil. Also, since the monopolar current for the destruction of tonsils is admittedly exceedingly difficult to control, it is entirely possible that if used in the form of desiccation within the tonsil, that charring may take place spontaneously, unobserved by the operator, the result of which unquestionably would be the early separation of the mass with resultant hemorrhage.

Where the proper bipolar coagulation technic was employed, there is little or no possibility of hemorrhage.

During the last six months, I have been working with an entirely new principle in the coagulation of tonsils, and the results obtained thus far seem to indicate that we may be approaching a much more definite and scientific means of controlling coagulation within the tonsil than has heretofore been possible. This work has been conducted with an instrument in which the indifferent electrode is entirely dispensed with and where coagulation takes place between two equally-sized active electrodes, both of which are introduced into the tonsil. The principle is not entirely new. However, after thorough investigation, I have been able to discover no record wherein the principle of bipolar instruments have been utilized heretofore in the removal of tonsils by electrocoagulation,—as we construe this method today.

In connection with this newer development, I am desirous of offering appreciation to Mr. Floyd C. White of H. C. Fischer & Company, New York City, for his untiring co-operation and assistance toward the instrumentation of this principle.

Technic

Since the number of completed cases to date by the newer bipolar instrument is necessarily small, my present description shall be confined to the most widely accepted technic, and upon which has been formed the basis of the conclusions already presented in this paper.

A 10 per cent cocaine solution is used topically by swab for anaesthesia. This is accomplished by gently swabbing the tonsillar pillars, tonsil, cheek and base of the tongue four or five times, at intervals of one to two minutes.

For an indifferent electrode, a piece of

block tin, measuring sixty square inches, is made to conform next to the skin over the patient's dorsal area.

The dosage to be utilized from the machine is established by effecting a "dead short" across its low voltage terminals and producing a meter reading of 3,000 milliamperes.

The tonsil which is to be coagulated is approached with the standard curved Dillinger Needle, with the idea of completely encircling the tonsil with successive insertions of the needle at about one-quarter inch intervals with the view to divorcing nutrition from that portion of the tonsil which is to be destroyed. The objective is to carry the coagulation factor to just sufficient degree to limit the blood supply to the level which has been coagulated. In this manner characteristic shrinkage or atrophy is brought about with the least possible amount of trauma to the tonsil itself, and with the gradual sloughing of the destroyed mass from above downward. Over-coagulation is conducive to charring with the resultant thickening and an early separation of the destroyed area en masse, and with possible attendant hemorrhage. The curved needle is always inserted into the tonsil in a lateral position so that its straight angle is on a plane with the aponeuroses, and its point always directed toward the center of the tonsil. Upon engaging the needle in the tonsil, sufficient traction is employed to pull the tonsil away from its base. The pillars of the throat must never be permitted to come into contact with the active needle electrode while the current is on,—since damage to these structures by the coagulation current is followed by varying amounts of postoperative distress. A foot-switch control is utilized, affording the operator complete control, and should never be engaged until after the needle has been inserted into the tonsil,—and should be released before the needle is withdrawn from the tonsil.

The number of contacts which are taken to each tonsil is entirely dependent upon the size and quality of the tissue. The very soft, highly friable tonsil may require only five or six individual contacts, whereas, the very large, boggy or fibrous tonsil may require as many as fifteen or eighteen insertion-contacts to accomplish the desired result. The same may also be said as to the number of treatments necessary to completely remove the tonsil.

In order that the patient may be perfectly comfortable at all times, it is advisable to treat but one tonsil at a time—that is to say, allowing intervals of one week between the treatment of each tonsil. Though occasionally where it seems in the best interest of the patient, I treat both tonsils at one time, and have been able to follow with the second treatment, one week later. Usually, patients do not complain of any more serious symptoms than a mild sore throat. Two or three treatments may be all that is required to remove the soft, friable type of tonsil. However, it is not uncommon to give five or six treatments to the very large fibrous tonsil.

Conclusions

1. Electrocoagulation of tonsils affords an ambulant office procedure which completely removes all of the tonsillar tissue. It is applicable to a selective group of patients for whom the usual surgical tonsillectomy is contraindicated.

2. The method as now employed has been reasonably well standardized as to equipment, instruments and technic.

3. From observations and research with the new principle of synchronization of the coagulation current to bipolar instruments a predetermination of coagulation in millimeters seems likely.

4. Such control factors will place the electrocoagulation of tonsils in the realm of scientifically exact surgery.

5. Electrocoagulation for the removal of tonsils is best accomplished by the successive-stage-treatment procedure, and hence, is time consuming.

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Discussion

Dr. L. Glushak (New York): Electrocoagulation of tonsils, we were told, leaves no unpleasant after effects following the operation. The method is so remarkable that a patient may be treated at the doctor's office and go back to business right way, even have his meal at the next period of the day. This surely speaks highly in favor of the method. The question still remains, however, does electrocoagulation entirely extirpate the tonsil; particularly its most infectious portion, viz. the upper pole, which is the most usual point of exit of infection? In many cases this upper pole may be so extended into the dome of the tonsillar fossa as to necessitate considerable skill in drawing it out of its bed so that it may be removed in toto. One is more concerned with the upper limit of the tonsil than with the lower, as the lower margin

merges with the lymphoid tissue in the lower part of the pharynx and is much more exposed to the eye of the surgeon, who can reach it more easily.

In the role of focus of infection it is found that the lower extremity of the tonsil is not nearly so important as the upper part. When tonsils are not thoroughly removed we often find a residue especially located in the upper region. Such residues are the most troublesome to the patient and frequently continue to be sources of infection. We have often found on re-operating in these cases that a piece of tonsil tissue in the upper region had locked up an abscess behind it which had been feeding the system with infection causing acute rheumatic fever, etc. The cases presented tonight show distinctly tonsillar residues in various parts of the tonsillar fossae. We have had occasion to examine throats that were electrocoagulated and found similar conditions existing.

Hemorrhages are said to be avoided by surgical diathermy method: yet we have seen hemorrhages occurring from 10 to 12 days post-operatively in such cases. The use of surgical diathermy through the snare, shows no advantage whatsoever over the usual methods, as the avoidance of bleeding at the time of the operation can be well carried out by thorough infiltration of the peri-tonsillar tissue with novocaine and adrenalin, and should there be a bleeding vessel it can easily be ligated. At the Post Graduate Hospital a series of cases were tried out with surgical diathermy snare and these cases showed as many postoperative hemorrhages 10 to 12 days after the operation as were obtained with the ordinary cold snare. I personally have tried out the method and am not in the slightest convinced that it has any advantage over the ordinary method of operation, except that it is a little more tedious.

I cannot agree that there are any conditions contra-indicative to the usual tonsillectomy which are favorable to coagulation. Dr. Haiman spoke of contra-indications in hypertension, exophthalmic goitre, and hemophilia. We have no difficulty in operating on hypertension and exophthalmic cases. As to the hemophiliac case with the joint involvement on whom Dr. Haiman set out to extirpate the tonsil to remove a focus of infection, one would question whether or not the joint condition might be more associated with the hemophilia than with diseased tonsils, and perhaps it would be wiser to leave such a patient alone, as the removal would, in any case, be speculative in the therapeutic value, while the patient has enough of a burden on him to carry his hemophilia.

I look forward to another source of danger in the recommendation of electrocoagulation of tonsils in that every general practitioner on the advice of a salesman of the apparatus will proceed to remove tonsils by this method. Not being skilled in the surgical operation he will leave residues, the consequences of which are readily understood. I therefore disapprove of

electrocoagulation of tonsils as a routine method, and cannot particularly endorse tonsillectomy by surgical diathermy method.

Dr. David H. Jones (By invitation), New York: Three essayists have spoken of the method of removing tonsils by electric coagulation, but it is evident from what they have said that it is only for treatment in special types of diseased tonsils and not to be considered as a routine measure.

I have seen Dr. Braun work with his snare method and with his new method. I cannot understand why he gave up the older operation because in using the small amount of current, the electric coagulation is almost the same as a cold snare.

Constructive criticism is, of course, always good. Dr. Silvers stated that his only opportunity to carry on his work was with his private patients. If he will communicate with me it will be possible for him to do some of his work at the Manhattan Eye, Ear and Throat Hospital, where the patients could be followed up and an unbiased opinion given.

Hemorrhages occur the same as before, consequently I see no advantage. Mention was made of the tonsil tissue at the lower pole, commonly called the infra tonsillar nodule of French, which in many patients recurs no matter what is done to remove it. In the series of nearly 18,000 tonsil operations performed at Manhattan Hospital, we have had only one hemorrhage occurring twelve days after operation and with this method, that is the time when most of the hemorrhages occur.

No mention was made of removal of the adenoids and I would like to know how they are treated by this method. The proper removal of the adenoids is much more difficult than that of the tonsils. Very few men are able to palpate the adenoid tissue.

Examination of the patients in the other room fails to convince me that this method has any advantages over the older operation.

As to technique: it has been stated that it requires a great amount of patience and the proper technique to master this method. The same holds good in performing a good tonsillectomy.

I was surprised to hear that tuberculous patients were operated upon, as experience has taught most of us to refrain from any operative procedures in tuberculosis.

Dr. Henry H. Forbes (by invitation), New York:

We certainly desire to give a vote of thanks for having had demonstrated before us the methods of removing tonsils by electrosurgery. Surely no one can question Dr. Silver's enthusiasm for this work.

If you will go back with me, it is probably fifteen, eighteen or twenty years ago, in 1903, that Dr. Finlay Cook had his instrument for desiccation shown in one of the journals. At that time we worked out the use of fulguration for the removal of diseased tonsils.

The surgical method is ideal for removing tonsils quickly. It is the best method for getting rid of adenoids. A patient should be given an opportunity to select the type of operation after full explanation. There is a much larger field for us to work in now that we have developed our technique. The contraindications to surgery are overcome in great measure by electrocoagulation. One or more questions have been asked me during the presentation of patients, all in friendly criticism. What is your complete technique? Can you show cases absolutely perfect, that is no lymphoid tissue remaining? I can show some such cases. On the other hand, I am quite sure that the best of us, even with our improved technique, will be surprised not only to find recurrent lymphoid tissue, but many deformities due to trauma.

I do think Dr. Jones is a bit skeptical. If he will give these men an opportunity to work out cases at the Manhattan Hospital, or perhaps they would be more at home in their own hospital, he will find that they are able to remove tonsils completely with practically no risk.

Dr. Farel Jouard (New York): I have been following the subject for a good many years and have had occasion to do quite a little myself. This is the most interesting and satisfying meeting devoted to electrosurgery of tonsils I have ever attended. All three of these men who have read papers tonight are masters of surgical technique in the removal of tonsils and are certainly in a position to compare their own methods with the newer ones.

Dr. Silvers emphasized the idea of a properly mastered technique and he elaborated this very well in his presentation. However, he very modestly says that only time and patience are required and that there is really "nothing to it." His own work is evidence that skill is indispensable.

I think the question of skill is an important one, and also that for the destruction of tonsils, it is necessary to have a complete knowledge of their anatomy. One should first learn how to remove the tonsils with surgery, so as to become acquainted with the structure. If skill is required for the surgical removal of tonsils, then much more skill is required for the removal of the tonsils by electrical methods.

If you are going to remove tonsils, surgically or electrically, the only satisfactory end result is the removal of all the tonsillar tissue with its accompanying infection. I believe that, theoretically, the only correct method of removing tonsils, by whatever instrument used, is to confine the operation to the loose, areolar, so-called "capsule" of the tonsil. Of course there are cases undoubtedly where this is not advisable. In those cases I think we are justified in using any method that will give good or approximately good results.

Dr. Haiman remarked that these newer methods should not be used as routine and I think that this point is very important. Un-

doubtedly there is no method that will take the place of clean surgery of tonsils.

As to bleeding, a bloodless operation can be accomplished by surgical operation as well as by the electrical method. Of course a great deal of the attractiveness of these methods is the absence of bleeding. These newer methods are more apt to be bloodless than the other methods, but that is not the whole thing. You are not removing the tonsils by any particular method simply to avoid the loss of a few drops of blood, but to destroy the infection. If scar tissue forms, you will later have more of a job than otherwise.

In the case of Dr. Braun's method, I might say that the heavy attendance at this meeting evidently shows which way the wind blows. The profession at large and the people are interested in the electrical removal as against the surgical, and the nose and throat men will have to adapt themselves accordingly. Even Dr. Braun has found it necessary to do that. I have seen his method demonstrated and I think the results, in his hands, are probably one hundred per cent perfect, although he would probably have the same result with his surgical operation. I do not see what the electricity adds to his technique, although it is very good. I think we all have to use electrical methods on suitable occasions, when the patient wants to have his tonsils removed by electricity I think he should be allowed to have it done by that method.

One point is to be emphasized. The electrical removal of tonsils is not to be done by anyone who merely owns the machine. The anatomy and structure of the tonsils should be known and the technique of removal should be thoroughly mastered.

Dr. William T. Power (New York): I first saw the electric treatment of tonsils demonstrated by Dr. Clark of Philadelphia some fourteen or fifteen years ago. I have myself been using the high frequency current on tonsils for about nine years.

These electric methods are of course for adult patients only.

As we all know there are many types of tonsils. It is important to follow an exact technic but this technic while exact must be elastic enough to be adaptable to the infinite variety of tonsils that will be encountered.

The new bipolar electrodes presented here tonight would appear to me to have a very limited field of usefulness. It seems to me that they might be used only on a large tonsil surface. I prefer a large indifferent dispersing electrode on another part of the body and a single point for the active electrode, because with the single point the exact location of each application of the current can be more accurately chosen.

I was particularly interested in Dr. Braun's presentation because I believe that the ideal procedure will eventually be to remove the bulk of the tonsil tissue at the first sitting by a cutting

current, and if anything remains, to clear up the fossa by coagulation or desiccation at subsequent treatments.

Dr. Braun's instrument is not unlike one demonstrated here a year or two ago by Dr. Morrison.

I still think that the perfect electrode for the cutting current has not yet been devised.

I like very much the thought expressed by Dr. Forbes that the patient should have the right to select the type of operation by which his tonsils are to be extirpated. I think they should have the advantages and disadvantages of the electric methods and the regular surgical methods clearly explained to them so that they may make an intelligent choice. The idea of having their tonsils removed at the doctor's office without loss of time and without hemorrhage appeals strongly to many patients.

I have stood before you here on another occasion and read a paper on electrodesiccation as distinguished from electrocoagulation of tonsils. At that time I advocated electrodesiccation only because coagulation of the tonsil en masse as practiced formerly entailed great risk of hemorrhage when the large slough would separate, but the present method of punctate coagulation obviates this risk.

While thorough extirpation of the tonsils can be done by desiccation much more rapid progress can be made at each sitting by coagulation. I have therefore adopted the latter method except that I usually complete each case with one or two desiccations to smooth out the uneven surface that frequently results from coagulation.

One should not attempt this work without a thorough knowledge of the anatomy of the tonsil and a distinct facility in the handling of the electrodes. Possessing these two essentials a very definite technic should be followed.

Only by the use of a pillar retractor can one be sure to clear the entire tonsillar fossa.

Very satisfactory and thorough removal of tonsils can be accomplished by present methods but there is room for improvement. One should be familiar with all methods of removing tonsils and should offer his patient that method which seems to be best adapted to him.

Dr. Lewis J. Silvers, closing: First may I take this opportunity of thanking Dr. Jones and Dr. Forbes for their most instructive and constructive criticism.

I feel that the methods we have now perfected are bound to come into general use in due course of time. Only those experienced in the anatomy of the nose and throat and initiated in the complex principles of electrosurgery will be qualified to perform complete extirpation of the tonsils. Recognition of normal epithelialized tissue like that of the plica triangularis, posterior to the anterior pillar or palato-glossis muscle, and sometimes markedly redundant in character, is most important in the proper execution of this technic. In fact, careful avoidance of all the innocuous adjacent tissues, and removal of only that which is deleterious, is the *sine qua non* of

success in electrosurgical extirpation of the tonsils.

The question of Dr. Jones in regard to the adenoids is of course most apropos. Adenoids as removed surgically rarely cause hemorrhage sufficient in extent to require operative interference. Adenoids are primarily a problem in children. This *modus operandi* concerns itself principally with the adolescent and adult patient. In passing I might mention however of the removal of adenoids in children as young as 5½ years by means of a special post palatine or retro-nasal electrode employing electrocoagulation. This is described in the case of a hemophilic aged six in my article in the October (1930) issue of the *Archives of Otolaryngology*.

Those who opine that the method is unsuited for universal application are correct in that we need not employ all the necessary care, patience, and perseverance in the average normal patient. I agree with them; this procedure was primarily perfected for those suffering from organic diseases contraindicating the radical operation. But those who think that part of the tonsil is left in situ as heretofore by the antiquated desiccation technic are laboring under a grave misapprehension. Here I disagree with them; the modified coagulation technic is capable of removing every vestige of round cell tissue in any of the accessible parts of the nose or throat. The lymphatic nodules seem to be particularly vulnerable to the high frequency current. Long after treatment, it will be noted that the round cells dry up and become absorbed. This action of the highly oscillating current is similar to the action of x-ray and radium. The analogy is more complete when we note the especial susceptibility of the lymphoid cell to any of these three physical agents.

Here in America, Dr. William Clark deserves much credit for his early work in the desiccation of tonsils. I owe much to Dr. McFee and to Dr. Wyeth, whose work I have followed up closely since 1921. Abroad we find pioneers like Dan McKenzie and Georges Portmann to be the leaders in diathermy as applied to otolaryngology.

In conclusion, may I emphasize a practical point peculiar to this multi-stage operation, which may clear up considerable misunderstanding. Patients often leave in the midst of tonsillar extirpation. Relieved of all clinical symptoms at least temporarily, they feel absolutely well and consider further treatment unnecessary. These are the incomplete cases seen by my confreres later, when the remaining stump of lymphoid tissue, inevitably flares up in acute inflammation, to many times its normal size. All patients are advised to report for observation over a period of one year following the completion of tonsillectomy. Cases seen six weeks or better six months or one year after electrosurgical extirpation present quite a different picture. The faucial fossae are clean, the shiny aponeurosis of the constrictor muscle may be seen through the thin translucent capsule, if that anomalous structure be present. The pillars are

intact, the plica triangularis or cradle of the tonsil usually shrunken and atrophied; the whole presenting a picture of lack of mutilation of the normal contour of the throat. A picture, which without doubt, in the completed case, approaches most closely the PERFECT tonsillectomy.

Dr. Jacob Braun, closing: I have been asked whether it is necessary to incise the anterior pillar. I do not think I have ever done that. There is no necessity for it.

I think Dr. Jouard made a very good suggestion in saying that every man who has done electrosurgical work on tonsils should be able to do a surgical operation of the tonsils. I certainly think he should do surgical operations until he has had a few heartaches and a few scares and he will then know how to properly evaluate the electrical methods.

As to Dr. Glushak's comment on the upper pole. Some years ago when I had the pleasure of working on a series of cases with Dr. Sluder I found that he always took the lower pole while I took the upper pole. I felt that the lower pole is always free but the upper pole is not always free. Why not look for the easiest method?

I think I have never enjoyed a meeting as much as I have this one, because it has brought out so many factors, not only from the laryngologist's point of view but from the general point of view.

Dr. J. A. Haiman, closing: Electrocoagulation has a definite field in removing the infected tonsils of arrested T. B. cases.

been taken care of in the previous papers.

With reference to other questions, these have

THE THERAPEUTICS OF COLONIC IRRIGATION AND PHYSICAL METHODS *

FREDERICK H. MORSE, M.D.

BOSTON, MASS.

The preservation of health and the prevention of premature decay of the human body is the aim of the medical man.

Outside of the results of injury, acute self-limited diseases, new growths and the like, it is infections generated within that abbreviates, or the absence of which, prolongs our existence by a large percentage. Infections can be visualized. Where treatment, whether medicinal or surgical, can be administered, it is simple as compared with the hidden but recognized toxemia in the various viscera.

Many factors enter into the production and elimination of infection, in prevention of repetition of toxemia and restoration of function, due to toxicity, which has its habitat when the colon is to be considered, not on smooth, normally curved colonic lumen, but in pockets, sacs, atonic areas, and oftentimes ulcerated membranes and even precancerous regions.

Sir James McKenzie, who has the respect and admiration of the whole medical world, in 1919 wrote as follows: "The chief aim towards which all endeavors should be bent, in medicine, is the prevention and cure of disease. Disease is rarely recognized until it has impaired the health of the individual, and produced suffering; and the concentration of

attention to this stage has diverted attention from the preceding stages.

"The importance of pathology is now so universally recognized that everywhere facilities are given for its prosecution, so that it can be said, that ample provision has been made for the study of the disease, after it has killed its victim.

"If we ask to find out, 'What are the facilities offered for the detection and cure of disease in the stage when it has not damaged the tissues?', we discover that there is little consideration given to this aspect of the matter. It is indeed instructive to reflect that, while men undergo a long and special training to enable them to recognize the appearance of disease after the patient has died, and other men undergo equally careful training to enable them to recognize disease after it has damaged the tissues, few or no attempts are made to train men for the detection of the disease when there is a hope of cure. If we do not know the early signs of disease, there is little hope of cure. The early stages of disease are, as a rule, insidious, and all indicated mainly by subjective sensations."

When one considers the responsible position that the cecum holds, we have only to visualize what may happen both locally and generally, when that portion of the digestive tract really goes bad, or in other words, be-

*Read at the Ninth Annual Meeting, American Congress of Physical Therapy, St. Louis, September 11, 1930.

come so infected as to be a menace from its septic dissemination to various parts of the body. For instance, arthritis can often be traced directly to putrefactive colonic bacteria. Colonic bacteria are found in tonsil tissue. Insanity is often relieved and apparently cured when cecum infection is dissipated.

Arterial hypertention and sometimes the opposite, extremely low blood pressure, is traceable to the cecum. Also "toxic" headaches and general exhaustion.

That there is a close pathologic association of the urinary tract and the colon is pointed out by Dr. F. H. Redewill and associates, of San Francisco, in the *Journal of the American Medical Association*, March 8th, 1930. "It is shown that owing to intestinal auto-intoxication and stubborn constipation, the colon is a site of focal infection and has a direct bearing on cases of acute and chronic nongonorrheal infections and the genito-urinary tract."

In such cases of colonic focal infection this condition has to be eradicated, preferably by methods to change the intestinal flora, in order to subdue or eradicate the offending pathologic organism, before the genitourinary infections can be definitely cleared up.

Other conditions might be mentioned as evidence of the great distribution through the lymphatic and blood stream that can be traceable to the cecum alone. Locally recurrent gall bladder infection, cystitis, leukorrhea, prostatic disturbance, lumbar and sciatic neuritis on the right side, also what is commonly known as "chronic", "recurrent", "relapsing" and sometimes "dyspeptic" appendicitis, when so much useless and often harmful surgery is done.

That the conditions referred to are not delusive and far fetched is proven and verified by the relief obtained when the cecum toxemia is diminished. This is not hard to substantiate because bacteriological findings in fecal material combined with second and third Radiograph of the colon substantiate the relief given, and is conclusive evidence of the importance of recognizing a toxic cecum.

Colonic Irrigation is entering so largely into the armamentarium of the physician especially those who are doing Physical Therapy work, that its place in medicine is assured.

The use of the sinusoidal current, carrying out the technic of treating constipation as is generally understood when combined with Colonic Irrigation, is often more efficacious in the treatment of Intestinal toxemia than when used separately. Many operators have used this technic for a long time, using the sine current and colonic irrigation on alternate days, which can be made to apply conveniently in hospital practice.

The above procedure is a routine work at Trenton, New Jersey, at the Insane Asylum. The mental derangements are relieved quicker and more lasting than by any other method.

In office practice, while the colonic irrigation is still in progress, abdominal surface electrodes can be adjusted, preferably of large size over the descending colon with the other terminal in the solution and wave current stimulation instituted, which in effect is practically a colonic gargle.

In conclusion, if a colonic irrigation process is to be instituted, we must first ascertain if there is an honest reason for it, depending not upon the patient's statement as to what they would like, but to be decided only by careful examination. In ulcerative forms of colitis or sigmoid malignancy, rectal conditions such as bleeding hemorrhoids, fissure and fistulae, the use of colonic irrigation is contraindicated. A possible incompetent ileocecal valve when present, may allow, through force from either water or tube, the cecum bacteria to pass into the ilium, where absorption would be greater and must be avoided.

The ailments that confront us where Colonic Irrigation is possibly indicated, come under the head of general and local toxic effects, results traceable to the cecum itself. The general septic disseminations may have a local manifestation in infected tonsils, arthritis in different parts of the body, arterial hypertention, and occasionally extremely low blood pressure; also "toxic" headaches, "rheumatic sore throat," "general exhaustion", nervous symptoms—all the way from hysteria to actual insanity—are also often traceable to the liberated putrefactive bacteria from the cecum.

Along with the history of the case, a radiograph by barium enema should make a positive diagnosis, or if that is not feasible, a diagnosis "without x-ray" may be sufficient in a portion of the cases. The writer feels

that too much stress cannot be made not to depend on colonic irrigation alone, or surging wave currents alone, but rather from the much desired and prolonged effect as would be expected from the combination of the two methods.

The relief of symptoms and radiographic verification by barium enema, with a second x-ray makes the operation in itself necessary and justifiable. Also the indications for colonic cleansing is the often recognized relief that comes from nearby organs and tissues which are diseased in consequence.

The writer has often observed that the threatened (by the surgeon) necessary operations are frequently postponed in consequence of the relief thus obtained.

The above conclusions are the result of careful observation which leads the writer to believe that tubes of a large caliber and of considerable rigidity should be rarely used, and then only in the hands of experts because a possible existing pathology may be productive of irreparable harm from its pure mechanical action. On the other hand a smaller and more flexible tube, with a special rectal speculum, can as easily carry the necessary liquid into the cecum which is the one and only essential, with much more comfort to the patient, and is an argument in its favor.

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Discussion

Dr. William A. Worster (San Gabriel, Cal.): I take it that we all have the high respect for Dr. Morse's pioneer work that it deserves, and I shall venture to discuss the paper with all the timidity of one standing before a master of his field. Yet, after having administered 2000 colon enemas for pictures similar to those he showed on the screen, and having administered from three to fifteen colonic irrigations a day for several years, I feel that I can speak with a certain amount of authority.

I heard Dr. Morse speak some fifteen years ago and tell of the interesting clinical results that he obtained with the sinusoidal current. I have since then duplicated his results by using the technic advocated by him. I found out by experience that he did not overstate his results. It is simply remarkable what can be done by cleaning out the colon and using the proper sine wave current, or I should say the Morse wave current.

The question of proper technic plays an important role in the end-result that one obtains in irrigation of the colon. This may be illustrated by a personal experience that occurred in my private practice. I had two technicians ad-

ministering colonic irrigations for me. With one I was obtaining splendid results, with the other the results were rather unsatisfactory. On a night when sleep was difficult the thought suggested itself that it was imperative for me to find out why the results varied so greatly between both technicians. I resolved to find out for myself. The next morning, I secretly called in two patients and gave both a barium meal enema followed by an x-ray picture of the colon. Several hours later both of these patients were assigned to each of the respective technicians for colon irrigation.

After they were through with their irrigations, I took both patients back for another picture of their colons. In the case treated by Technician No. 1 the barium was gone and the colon was clean. In the case treated by Technician No. 2 there was only one-third of the barium gone. That taught me a lesson. It is easy enough, I don't care what size tube you use, whether it is long or short, to get water over the cecum. To get it out again is a question of another nature. The emptying of the cecum is what concerns me most. It isn't a question of whether your tube is three or six or eight inches; it is a question of whether you do thorough work.

I will say this: With the tube only inserted twenty inches you can clean out the cecum, with the tube inserted only twelve inches you can clean out the cecum. I have inserted tubes clear over into the cecum, putting them in forty-two inches (I know they were there because I have the pictures), and have utterly failed. My suggestion is to get the tube as far as you can with safety but never try to push it in until you double it up because when you double up forty inches of tube it is far worse than three inches of tube put in straight.

I want to thank Dr. Morse for his paper today because he justifies the very thing I have been doing. I want to tell you and tell him personally that he is the man who gave me the inspiration to do this work about fifteen years ago. (Applause)

Dr. Jacob Guttman (Brooklyn, New York): For an internist to discuss a paper written by so expert a man as Professor Morse, as the previous speaker said, makes one feel like a new graduate in the hospital when he is confronted with the head of the profession. I want to agree with a few points that Dr. Morse brought out. Even though Schellberg was not a medical man, he has written a book on colonic therapy and introduced new tables and methods. I believe we owe him considerable appreciation for his work. Certainly it is not possible in every case to use the tube up to the cecum, nor is it possible for every man to introduce a tube to the cecum. But you may introduce a tube to the cecum in certain cases, and not in some other cases, as Dr. Morse has shown here on the x-ray prints.

We have had occasion many times to verify the contention of Schellberg that you can introduce a tube up to the cecum. It has certain

advantages when you can do that. No doubt we know well enough, as the previous speaker has said, that with three or four inches in the rectum you can fill the whole colon to the cecum and beyond that. That has been and is being done every day in hospitals for radiographic purposes. You do not accomplish what you want to accomplish by high rectal enemas, by colonic irrigation. Imagine that this is the colon. If you introduce your tube way down over here, what happens? By letting the water run that way there is no outlet. The water must run back over that way and carry with it everything that lies along the colon. On the other hand, if you introduce a tube three or four inches in the rectum, pushing everything that lies in its way over the cecum, you are doing just the reverse of what you want to do. In other words, you are pushing a lot of bacteria and a lot of fecal matter and a lot of gas and everything else obnoxious into an area of the epithelium, which is an absorbing area. You are really not washing your colon out at that time. Of course you may fill up the colon and then when the patient tells you he has severe cramps, you pull out the tube and allow it to pass out. That is not real irrigation in the sense that we mean. On the other hand, if you have your tube in as far as possible, letting your water continually flow in and out, you are washing the patient out. There is a difference when you introduce your tube only a few inches in that way and when you attempt to introduce a tube away up here as closely as possible to the cecum.

It is not possible to do it in every case with every kind of colon. You can introduce it in a fashion, but a good technician, one who has done this work again and again, can do it right. Not every technician and not every physiotherapist will do that. By putting the patient in a certain position and by filling it gradually with the fluid, then by manipulating the abdomen to the outside you will find that your tube goes as near as possible to the cecum. It will not be just as the doctor has shown, all coiled up again and again. That is true. We have had occasion to verify that. When we thought the tube was inserted far enough we found it curled up in the rectum, or probably coiled in the adjoining sigmoid.

I want to express my gratefulness to Dr. Morse for bringing up the subject of intestinal toxemia. It is unfortunate that a great many physicians do not seem to realize the importance of intestinal toxemia any more than they do. They don't understand how such a thing could possibly happen. They will bring over Patient So-and-so who goes along three or four days without an intestinal movement and with absolutely no symptoms whatever. It is true that particular individuals show no effect of constipation for many reasons. That is not really true in intestinal toxemia. There is no data at all, we all know. We know the physiology of the gastro-intestinal tract. When we talk to the average man about intestinal toxemia he has in

mind nothing but protein decomposition, protein putrefaction, which is not quite true. We can have intestinal toxemia from carbohydrate fermentation and the formation of lactics just as much as we can from putrefaction of proteins. Of course, it is true the protein is the filling matter, and when it is broken up into acids and those are not eliminated by various means that is the time when the intestinal toxemia begins. As I said, we have not only the trouble due to the proteins alone, but the carbohydrates do their share. The fats will cause the same condition as proteins will. Whatever methods you employ to relieve the intestines of these protein combinations and carbohydrates makes no difference as long as you eliminate them.

I agree fully with Dr. Morse on the point that you can't eliminate all along the colon unless you combine your colonic irrigation with something else. You will get no results otherwise. You must make use of every means.

I personally would never allow any high colonic irrigation on any person unless a lower colon study had been previously made. If a patient shows any signs of tuberculosis or any signs of ulceration in the primary stages of carcinoma, which condition can readily be determined by an x-ray study, I would certainly not permit a high colonic irrigation, pushing or pulling the tube one way or the other, which would cause scars. When your x-ray shows after 48 or 72 hours that you do not have such indications in your colon, when you have no severe pathology, you can rest assured that with colonic irrigation, under those circumstances, in combination with some enemata properly given, and also the wave current, you can get results.

I was the first man to use the Morse wave machine when it came out so many years ago. I find it gives us at least a very satisfactory result.

Dr. Frederick H. Morse (Boston, Massachusetts), closing: I should like to talk for an hour and a half on the doctor's last remark, but that is clearly impossible. I shall say this: We cannot base our deductions on exceptional cases. We have to strike what seems to meet with the majority. It is only in the exceptional case that the tube goes in all the way. People who don't know how to use the tube, technicians who are not properly instructed or who don't know and have never known and don't want to know, can do all kinds of harm in the very case he mentioned. That is with the sigmoid, cancerous ulcer, and so forth.

One of Mayo brothers, I believe, once remarked that the sigmoid is the most prominent place for malignancy of any part of the digestive tract. Apropos of that and as we get older and know more about it when we get a sigmoid like that we want to be careful with what we are doing in there. We might do damage that would be permanent.

As I said before, however, from 8,000 x-rays that my assistants and myself have taken, I find that the barium had no trouble getting over into the cecum. The barium had no trouble with the

small tube. Why should we have trouble getting liquids in there? The inside of the intestine is like the inside of a rusty pipe. That is the element of danger and not because there is no objection to it.

I know Schellberg very well. He has given this subject a great deal of study. Outside of the technic of the application, we may find men with different ideas about the way it should be administered. That is a small item compared with the great essential that it is one of the things that is part of our elimination process that we shouldn't overlook.

The frequency of treatment depends on your

general knowledge of the case. With the average case of so-called constipation, perhaps three times a week is enough at first. Then two times a week, graduating it down after you commence to get results and the conditions are bettered. Then follow with your wave currents and don't forget the diet.

Question: Did you ever get water in there and couldn't get it out?

Dr. Morse: I have a trap down there myself. I have personally taken the treatment many times and find that in spite of my advanced age I feel the stronger for it. I can work much better afterward.

GLEANINGS FROM SCIENCE

Part of Cosmic Rays May Come From Sun

Cosmic rays, the intensely "hard," all-pervading radiation that comes from somewhere in outer space, may come in some small degree from the sun.

This is indicated by recent researches of Prof. Viktor Hess of the University of Graz, Germany, one of the pioneers of cosmic ray research. With instruments set on heights in the Alps, he and other physicists have detected a very slight increase in the intensity of the radiation when the sun is at mid-heaven. This averages only about one-half of one per cent of the total radiation, but according to Prof. Hess it is a constant, and hence probably a significant, variation.

If the sun really is the source of even a small fraction of the cosmic radiation, it lends support to the view held by a number of European scientists, that these rays come from the stars, for the sun itself is a star, and not a very large one at that. Experiments conducted by two of Prof. Hess' colleagues, Dr. O. Mathias and Dr. Steinmaurer, have indicated that there is about a two per cent daily variation from average intensity. They are still engaged in checking up on this result.

Prof. Hess adds, however, that even if the stars are definitely shown to be sources of cosmic rays, this does not wholly shut out the possibility of a part of the rays coming also from interstellar space, the source believed in by the American school of investigators.—*Science News Letter* (April 18), 1931.

Life Is Rare in Universe Astronomer Believes

Life is a rare phenomenon in the universe, Sir James Jeans, British astronomer, assured the Franklin Institute meeting at which he was presented the Franklin Medal, one of Science's highest awards.

"I leave it to you to be pleased or not," Sir James said, "at a large fraction of the life of the universe being concentrated on our planet."

His theory is that the planets were formed by the close approach to the sun of another star that pulled out of the sun by tidal action a great cigar-shaped streamer of gas, which condensed like drops of steam into the planets.

Since stars are scattered in space as sparsely as three grains of dust in a large room, the close approach of two stars is a rare accident of the universe, Sir James explained. Life can only exist on just the proper kind of planets created by such passing of stars in the universe. For this reason Sir James considers life very rare indeed.

Sir James has been lecturing in many different parts of the country during this week and last.—*Science News*, May, 30, 1931.

Alternating electric current is more dangerous at low voltages than at high, it was discovered through experiments on rats at Johns Hopkins University: with the ordinary house potential of 110 volts, 100 milliamperes

will cause death.—(*Science News Letter*, Dec. 27, 1930.)

A new x-ray mechanism that will bring the organs of the body to view in three dimensions and show their motions has been perfected by Dr. Jesse William Du Mond and Archer Hoyt, of the California Institute of Technology, and C. H. Brandmeyer, of Los Angeles. For two years these young men have been striving to produce something more than a flat, beclouded picture and thus increase the scientific value of x-ray photographs.

The new invention, which they call the "Visual Fluoroscopic Stereoscope," will be demonstrated at the meeting of the Radiological Society, at the Biltmore Hotel, Los Angeles, from December 1 to 5.—(*Science News Letter*, Dec. 27, 1930.)

The X-ray in Industry

Considered by many as more important than its use in medicine, the application of x-rays to industrial problems promises to extend the valuable assistance of this little known boon to humanity almost without limit.

As the doctor studies the muscle and bone structure of a human patient, so does the industrial x-ray expert look through iron and steel, wood and rubber, and a hundred and one other materials, seeking out defects and studying the internal structure.

The University of Illinois has found out many things of utmost importance in the application of the x-ray to the solution of industrial problems. The x-ray is discovering hitherto unknown qualities or properties of scores of industrial materials in order to utilize them more efficiently. Studies of commercial commodities like rubber, for example, have revealed valuable phenomena concerning its behavior during stretching and after composition changes. Metallic alloys, fabrics, electric transformer plates, asbestos, corrosion in iron, paper, petroleum, products, and some organic chemical substances are among the materials studied. The use of the x-ray is opening a new field in industry by aiding the production of more standardized materials,

the utilization of hitherto neglected substances, and improvements in the quality and efficiency of manufactured articles in everyday use. Great industrial concerns are realizing the value of the x-ray in solving their problems and now look to this university for the extension and development of the work.

The Properties of Radon

Radon, or the emanation of radium, has certain therapeutic applications concerning which Professor Rathery and M. Molin ry have made a careful study, the results of which they presented recently before the Academy of Sciences. It produces interesting modifications of the general metabolism and, in particular, lowers the development of uric acid. Its effects are very marked in chronic rheumatism and gout, which supports the belief that it causes a stimulation of certain functions of the liver. This would explain, they think, the effects of thermal springs in these pathologic states—effects that have been known empirically for many centuries and that may be associated with radio-active emanations. The same effect has been secured, away from the springs, by inhalations of radon.—*Foreign Letters, J. A. M. A.*, 96: 1964 (June 6) 1931.

Liver Extract Makes Plants Green

Liver extract, successfully used to check the course of pernicious anemia in human beings, has been used to check the analogous yellowing of plants placed in the dark, by Prof. Oran Raber of Immaculata College, Pa. Prof. Raber reported this research in Cleveland before the American Society of Plant Physiologists.

The activity of liver extract in checking this yellowing, or etiolation, of darkened plants, raises again the question of the possible physiological relationship between chlorophyll, the substance that makes leaves green, and hemoglobin, the stuff that makes blood red. Liver extract keeps red blood in the veins of the anemic, it now appears to keep green chlorophyll in the leaves of plants.—*Science News Letter*, January 3, 1931.



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EDITORIALS

ELECTROSURGERY IN RELATION TO THE REMOVAL OF THE TONSILS

It is now about a decade since American surgeons took up the use of high frequency electricity as a means of extirpating the faucial tonsils. The difficulties encountered in this earlier experimentation were many, yet in spite of these, the method attracted staunch adherents who attempted to perfect apparatus and technic. The specialist, except in a few instances, was reluctant to adopt electrosurgery for tonsil extirpation. To him it seemed that the procedure was a fad which would pass into disrepute when the height of enthusiasm would wear off. The result of this attitude was detrimental to the best interests of electrosurgery in general. Soon the charlatan saw a means of quick gain and began to prey on a gullible public which was ready to submit to any new treatment which purported to obviate the necessity of hospitalization. One of the chief attributes of electrocoagulation of tonsils, it was claimed, was the avoidance of hemorrhage.

The charlatan prospered for a time, but the

method was constantly subjected to criticism. This was only natural in the face of poor results at the hands of ill-trained clinicians. Only a few ethical specialists had continued to master the technic. Those who had perfected themselves in it were giving their patients the benefits of good surgical skill. Their results were comparable to those of perfected surgical enucleation. These very specialists, however, had created paths for professional criticism and were bringing upon themselves all the displeasures which the uninformed usually bestow.

With the passing of this period a saner viewpoint has been assumed by those who are open minded and who are willing to observe the accomplishments of newer scientific developments. Inventories have been taken of the causes of failure. A constructive rather than a destructive attitude is evident. Silvers in his paper aptly states: "By elucidating the methods for successful electrothermic extirpation of tonsils and by noting the causes of failure, it may be possible to clarify a new

subject which has been shrouded by ignorance and misunderstanding."

Now, the tide has turned. The method has been wrestled from the charlatan. The laryngologist sees in it possibilities and endeavors to work out some of the shortcomings. Efforts are being made to define the indications and contraindications, to standardize apparatus and technic, and to rationalize the utilization of the method generally. Surgical tonsillectomy passed through an evolution which took several decades to put it in its present status. It is, therefore, not unreasonable to accord electrosurgical tonsillectomy a like period. In fact, surgical tonsillectomy still remains an imperfect procedure. Authorities are agreed that its many imperfections are sufficient reasons for closer investigation of any means of tonsil removal which offers possibilities of successful results.

Time has also brought about changes in the nature and development of the high frequency current. The cutting current is still in its period of development. Yet its use is sufficiently perfected to permit application in various fields. Braun,² employs the cutting current in connection with the snaretome. The purpose is enucleation of the tonsil rather than fractional extirpation. The cutting current passes through a fine wire through which the pedicle of the tonsil is severed. Thus the operation is similar to surgical tonsillectomy, with the added use of the cutting current to seal the blood vessels with a fine coagulum which holds until healing begins. It is said of this operation that it is painless and free from immediate hemorrhage in the large majority of cases.

A further deviation from the customary technics is suggested by Haiman.³ In principle it may approach a much more definite and scientific means of controlling coagulation within the tonsil than has heretofore been possible. The indifferent electrode is dispensed with and coagulation takes place between two equally-sized active electrodes, both of which are introduced into the tonsil.

While these variations in technical application are of interest, the end result is the same, gradual extirpation of the tonsil. The fact that recognized workers are falling in line is simply an indication that electrocoagulation of the tonsils is gaining favor. Electrosurgery is used extensively in practically every specialty. Its employment in otolaryngology is a

natural sequence of therapeutic progress in surgery in general. This does not necessarily imply that electrosurgical removal of tonsils is a panacea, or that it has replaced surgery. In fact, there is no need for such a change. As has been pointed out there is ample need for an aid to surgery in tonsil work and electrosurgery represents the modern achievement as such.

Only time will properly determine the types of indications for which electrosurgery is adaptable. Certainly a good working basis is included in the contraindications for surgery. Considerable work has already been done, but more is necessary. The final conclusion will be, as has been repeatedly stated in these columns, that electrosurgery fills a definite place in our therapeutic armamentarium, so far as tonsils are concerned, and that it is a modern achievement of merit as an aid to surgery.

The advantages are well known. Probably it would be better if the limitations were as thoroughly appreciated. Too much stress has been placed on the "bloodless method" phase. Caution should be exercised in this connection. Secondary hemorrhage is an important factor. It is being reported more frequently now than before. This does not detract from the value of electrosurgery. It simply puts us on the alert and opens up a further field of investigation. We must not misrepresent our claims. The "bloodless method" phase should not be stressed without reservations. The advantages overshadow the disadvantages, and, as time goes on, electrosurgery of tonsils continues to gain greater and greater favor for a selected groups of cases.

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ON THE 70TH BIRTHDAY OF OSCAR BERNHARD

On June 24, Oscar Bernhard, recognized as the leading pioneer of modern heliotherapy

in high mountain regions will reach the 70th year of a very fruitful life. The occasion deserves prominent mention because of the outstanding service rendered by this man in connection with surgical pathology and physical therapy. Ever since the last decade of the nineteenth century Bernhard has been the most consistent advocate of open-air therapy and the healing power of sunshine in high altitude regions. He has contributed richly to the literature on the subject and was the first of that talented group of Swiss physicians (Bernhard, Rollier and Dorno) to establish a scientific background for the usefulness of natural ultraviolet radiation or high altitude Alpine sunlight in the various types of chronic conditions found associated with surgical tuberculosis. It is interesting to realize that the present method of treatment and management of these patients has varied very little from that originally adopted by Bernhard.

Bernhard's pioneer work antedates that of his more spectacular colleague and disciple, Rollier. The question of priority labor in the exploitation of modern heliotherapy has often been raised in recent medical literature, and popular opinion has often credited the latter with the major honor. Particularly in America was this opinion somewhat firmly fixed. The reason for this is not difficult to analyze when we recall our inherent weakness with foreign languages and the prior existence of the translated publications of Rollier's work. It is certain, however, that Rollier above all others would be the last person to deny his friend the just rewards of priority, or bask in the uncertain glory of another man's achievements.

The moment is therefore opportune to correct this misconception from becoming more widespread and too firmly entrenched in the literature of modern medicine. No less an authoritative source than the personal communications from Rollier to Bernhard, found in the second edition of the latter's book, *Sonnenlichtbehandlung in der Chirurgie* ("Sunlight Therapy in Surgery") is utilized for this purpose. Rollier therein expresses satisfaction and great appreciation for the guidance given him by Bernhard and purposes to follow the successful method originated by the latter. In a communication dating October, 1904, Bernhard calls attention to the following enthusiastic expression

from Rollier. "*Im Oktober desselbin Jahres berichtete er mir über seine schönen Erfolge bei acht mit Sonnenstrahlung behandelten Fällen, wovon fünf tuberkulöser Natur waren. 'Voilà, cher monsieur et très honoré confrère, les heureux résultats obtenus avec votre excellente méthode que je vous remercie de m'avoir conseillée.'*" ("There, dear sir and very honored confrère, the fine results were obtained with your excellent method for which I have you to thank for guidance.") Rollier referred to his very earliest experience in the treatment of eight cases with heliotherapy, five of them tuberculous in nature.

Oscar Bernhard was educated in Heidelberg, Zurich and Bern. In 1886 he established himself in the town in which he was born, Samoden (upper Engadin) as a practitioner of medicine and surgery. He was a co-founder and in charge of the County Hospital until 1905. He then moved to St. Moritz where he opened a private surgical clinic wherein he made use of natural sunshine and open air treatment on the scientific scale now so widely appreciated all over the world. The World War temporarily interrupted his private labors, but during that period he was actively occupied as a surgeon in charge of many different Lazarettes (field hospitals) for treatment of indolent orthopedic wounds and surgical tubercular conditions of disabled soldiers. At the instigation of the Grand Duchess Louise of Baden, Bernhard in 1915 also opened Sun treatment clinics in the German Black Forest at Durrheim for the benefit of those German soldiers suffering from similar conditions mentioned above.

That Bernhard is the ranking authority in this special field of therapy is indicated by the many contributions, at least fifty, that have come from his pen during his active leadership in medicine. The monograph mentioned above is one of the finest contributions to the subject. That his work has been widely appreciated is indicated by the many honors that have come to him in the past. The doctorate of Philosophy was presented to him by the University of Frankfurt. He is an honorary member of various Austrian, German and Swiss medical societies. He is a fellow of the Royal Institute of Public Health of London. America has, however, been lax in according this pioneer the recognition that is due him. Our indolency in this regard has

often been the cause of critical comment from our colleagues abroad. The American Congress of Physical Therapy should take immediate steps at its next convocation to pay official tribute to his contributions in the form of special honor to him.

Bernhard's avocation is of no less interest to us than his vocation, and has been the means of some very substantial contributions to the history of medicine. His hobby for many years has been confined to the field of numismatics or ancient coins. As the possessor and owner of a very large and rare collection of antique coins he has published some extraordinarily interesting studies regarding Hydrotherapy and Hygiene, interpreted from the figures impressed on certain Greek and Roman coins. From these he has also described exercises and physical culture methods that existed in ancient times, as well as the antiquity and progress of medical culture of particular eras in the civilization of ancient Rome and Greece.

We are happy to offer our most sincere felicitations on the occasion of his 70th birthday. It is pleasing to note also that Bernhard is at present in full possession of physical and mental health and that he is engaged in the same constructive pursuits that has occupied his attention in the past half a century. We wish him continued strength and happiness in the remaining span of what is to be hoped a very long life.

LOWER BACKACHE AFFECTIONS

Lower backache affections have probably contributed as much toward reducing the efficiency of the individual as any of the other major rheumatic conditions known to medicine. Its widespread distribution among all classes has placed it in the forefront of the social and economic problems confronting mankind. The close relationship between occupation and intoxication to the incidence of this affection is so well recognized that special sections for its study have been set aside by organized groups interested in the general problem of rheumatism. Up to the present time all attempts to check its morbidity, the associated pain and its recurrent tendencies, has taxed the best efforts of the most ingenious and brilliant in the profession. The treatment has been as varied as the cause in back of the

condition, the results as variable and as spectacular as the enthusiasm of the statistician and optimism of the practitioner. Much of the restorative changes can be categorically attributed to nature and its beneficent healing power—a power which often travels side by side with the healing medicinals of man's improvisations. The virtues of home remedies is therefore to be explained on this basis, as are also the curative powers of the various "isms," "ics," and "opathies."

The lack of appreciation of the many factors that enter into this problem has probably been the cause of much of the trial and error method displayed in its treatment. This situation is exemplified in the management of the lower backache difficulties, particularly those associated with disturbances distinguished as lumbosacral, sacroiliac and sciatic scoliosis. Sufferers from the foregoing types of rheumatoid affections have been the outstanding pillars in support of faddists and border varieties of practitioners. Like prodigal sons they wander about in these byways and come back to us sadly disillusioned and poorer in health. It is time that we recognize the situation as it exists and assume the responsibility with the full knowledge of our limitations. We frankly have no panaceas or specifics for the control of the rheumatic state but we have in the intelligent combination of the physical and medicinal methods the closest approach to specificity now known to medicine. The situation calls for greater cooperation between the existing specialties and less differentiation of method. Orthodox medicine has at times dallied too long with the healing power of nature. In the case of the conditions under discussion our reactionary methods have often resulted in driving these patients away from our doors and into the laps of charlatans.

With the scientific methods now at our command, our ability to give relief to these patients is assured. The medical practitioner now occupies a most strategic position in therapeutics. He has all the advantages of the newer information concerning diagnoses, drugs, vaccines and non-specific proteins; preventive and dietetic measures; physical agents such as heat, light, static electricity, hydrotherapy and

manipulation; proper orthopedic intervention. The physician has, therefore, at his disposal the most flexible form of a therapy to combat lower backache affection ever known to medicine. Unfortunately, however, our failures are most often due to our unbalanced method of managing these cases. The experience of the individual is no greater than his willingness to learn, and no deeper than his ability to appropriate the information before him. We are prone to become lopsided in our methods because of closer contact with special types of practice. Overspecialization is often productive of extreme points of view. Each specialty can invoke the richest evidence in support of its contention.

Just recently our attention has been directed to several new publications on the subject of physical therapy in which separate agencies are lauded in the treatment of so-called sciatica. One rises to panagoric heights in support of static electricity;⁽¹⁾ another sings the praises of diathermy.⁽²⁾ The purpose of our theme is to emphasize the value of all rational combinations of established scientific methods. It is our contention that the greatest benefits can only come from the most rational use of all measures. And what has been said against one sided methods in physical therapy can be equally said against the other specialties, for example, the orthopedist. The views of the orthopedist in regard to the utilization of physical measures in connection with sacroiliac or sciatic scoliosis is as vague as the utterances of a Delphi oracle. An illustration of just such a situation is to be found in no less a paper than that of Kleinberg,⁽³⁾ printed elsewhere in this issue. It is a masterly summarization of the accepted facts regarding the various

factors that influence and control the mechanism of sciatic scoliosis. Immobilization is his *leit motife*: physical therapy is merely an interlude.

The intelligent physician should reduce the value of both foregoing measures to a common denominator and raise the standard of treatment of lower backache disturbances to the level in which all factors are taken under proper consideration. The management of these cases should consist in early recognition of the complaint, the provision of intelligent treatment, the régime of which should consist largely of balanced administration of essential physical measures, medicinals, eradication of the focus of infection, the limitation of motion by rest or orthopedic measures and occupational therapy.

It is naturally assumed that not all patients are required to pass through the entire gamut of the measures mentioned above. Not all types require hospitalization or special fixation, but most of these cases can be returned to a normal state by the early introduction of physical measures. The spectacular results so often obtained by these measures warrants the great emphasis now placed upon them by all physicians of large experience. In the light of the increasing literature on the subject lower backache affections is a serious complaint in need of the most intelligent efforts of the medical profession.

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PHYSICAL THERAPY CLINICS

PHYSIOLOGY AND THERAPEUTICS OF THE VARIOUS CURRENTS AND RADIATIONS *

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In this introductory lecture I desire to give you a broad general review of the physics, biology and therapeutics of those currents and radiations which are used in physical therapy.

On the top of this chart (I. Biophysical foundations of physical therapy; electrical currents, radiations) the various currents and radiations are arranged according to the respective frequencies or wavelengths. A scale comparable to an inch ruler is added, which gives the wavelengths from 1 million kilometers to 1/100 of an Angström unit (\AA) or 1/1000 millimicron ($\mu\mu$), and the frequencies from 1/10 to more than 100 trillions cycles per second. This wavelength-frequency scale demonstrates also the reciprocity of wavelength and frequency. The shaded areas above this ruler indicate the present extent of the various waves and rays and demonstrate the overlapping of the shortest radio waves with the longest infrared rays, of the shortest ultraviolet with the longest x-rays, and of the shortest x-rays with the longest *gamma* rays of radium. The therapeutic usefulness of these various radiations is also indicated. The direct current is contrasted to the low frequency alternating current, having no wavelength or frequency. The short wave *gamma* rays are compared with the alpha and beta rays of radium, the latter ones representing corpuscular rays of lower velocities than the velocity of all the other radiations.

An outline of the history of discoveries and therapeutic development follows. It is shown for instance that Nichols and Tear have torn down the border between infrared and high frequency, that Millikan extended the ultra-

violet into the x-ray region, Dessauer the x-rays into the area of the *gamma* rays, etc.

For the direct current and the low frequency currents one has to distinguish between low and high voltage; this distinction is carried through all the way on the chart, "a" representing low voltage, for instance galvanic electricity, sinusoidal currents; "b" representing high voltage, namely, static electricity and faradic currents. The schematic pictures give an idea of the apparatus and methods used for producing the various currents and rays; the characteristics of some of the currents are also given.

The vertical broken line in the center of the chart separates the various currents (at the left) from the radiations (at the right). In case of currents the patient is inserted in a closed circuit by use of various electrodes; in case of radiation an emission of energy takes place and strikes the patient outside of the generating system.

The general penetration of the various radiations through human tissue is demonstrated schematically by a curve. Visible light has a certain penetrating power, which decreases in the near ultraviolet and infrared. The far ultraviolet and infrared have no penetrating power. In the x-ray and *gamma* ray areas the penetration increases again and reaches much greater values than in the visible area; the same holds true of the Hertzian waves in wireless telegraphy and telephony. This indicates the existence of two broad absorption bands, in which radiation energy is transformed into other forms of energy; in case of ultraviolet and x-rays inner-atomical changes occur, resulting in chemical effects; in case of infrared and Hertzian waves molecular vibration is pro-

* Clinic Conducted at the Ninth Annual Meeting, American Congress of Physical Therapy, St. Louis, Mo., September 8, 1930.

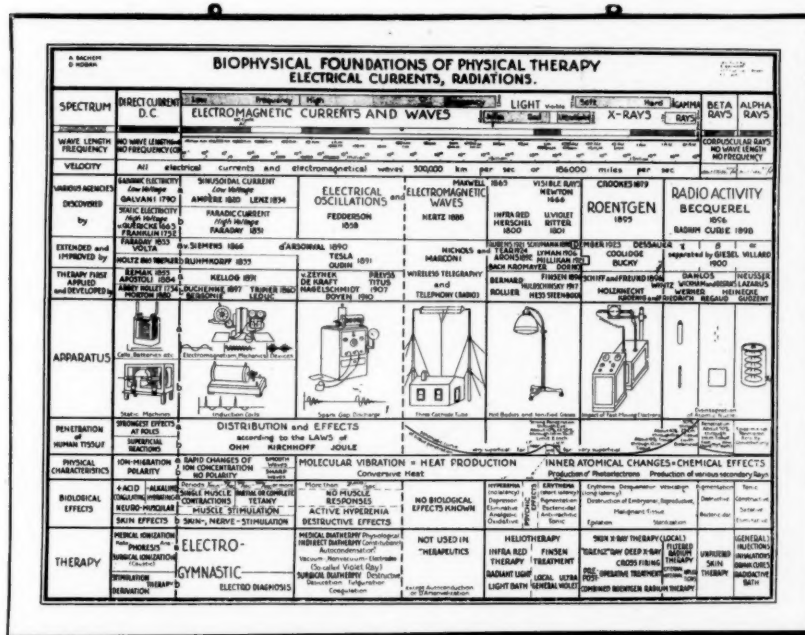


CHART I

duced, which is identical with heat. The distribution and effects of electric currents are governed by simple physical laws: The law of Ohm, which gives the relation between voltage, resistance and amperage; the laws of Kirchhoff, which describe the current in complicated circuits, which may be in series or in parallel; the law of Joule which determines the heat production from the given electrical factors. At the bottom of the chart is given a condensed review of the biological effects and the therapeutic use of the various currents and radiations. These items are worked out in detail in the five following charts.

Radium is covered by the second chart, (2). Becquerel's discovery of uranium activity opened the whole field in 1896, (left upper corner). Two years later radium was discovered, four years later radium-emanation. At the same time the three different kinds of rays, *alpha* (α), *beta* (β), and *gamma* (γ) rays were separated. In the next years the transformation theory was introduced, which explained the generation of the radio-active energy and the relationship between the radio-active elements. Lead was recognized as the final end product of radio-active decay; but by artificial bombardment with *gamma* rays, even nitrogen could be disintegrated into helium and hydrogen.

At the present time most of the radio-ac-

tive elements are arranged in three series. Uranium, proto-actinium, thorium, the three elements with the highest atomic weights, at the end of the periodic system, are the parent elements; three varieties of lead, with slightly different atomic weights, are the end products of the radio-active disintegration. The relative position of the most important radio-active elements, and their properties are given in this section. For example, we see that it takes 1,690 years for a 50 per cent decay of radium, and that nothing but *alpha* rays are given off; it is the disintegration products from RaB to RaE that produce *beta* and *gamma* rays.

The various properties of *alpha*, *beta*, *gamma* rays are described in another section (upper center). *Gamma* rays terminate suddenly; the maximum distance they reach is called their range, *beta* and *gamma* rays are absorbed gradually; their half value layer gives the thickness of material which absorbs 50 per cent of them. Ten times this thickness absorbs 99.9 per cent and transmits only 1/10 per cent. The pictures illustrate the various rays, made visible with Wilson's method in which the rays produce ions, and these condense water vapor to droplets which are photographed; the pictures are schematic negatives of those photographs.

The various radio-active units in use are

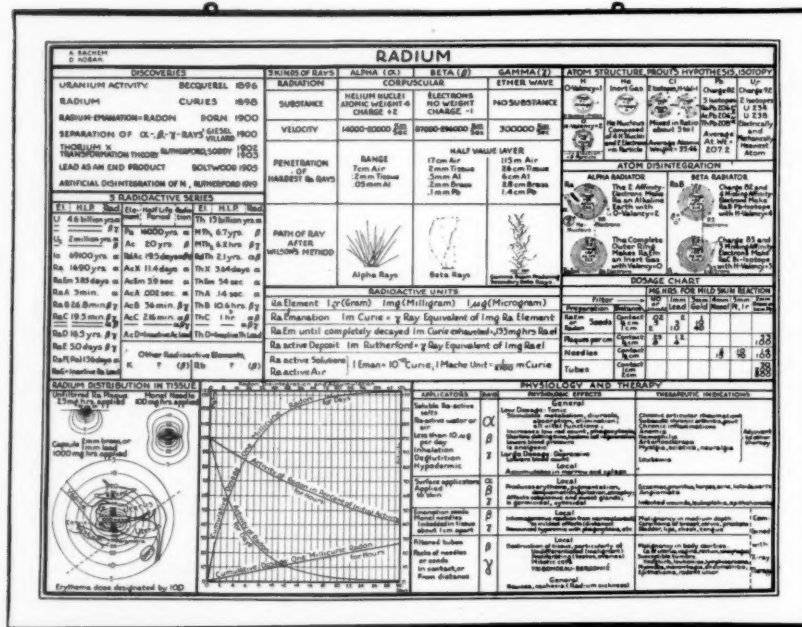


CHART II

compiled in the next section; this part is self-explanatory. The physics and chemistry of radio-activity, isotopy, and valency are demonstrated in another section, (upper right corner). The elements are composed of a nucleus, carrying the whole atomic weight of the element and a positive charge, which is characteristic of the element and determines its place in the periodic chart. The nucleus is surrounded by negative electrons of such number as to neutralize the charge of the nucleus. The electrons are arranged in orbits, carrying a certain maximal number of electrons, represented by the figures 2, 8, 18, 32, respectively. Hydrogen carries one electron; it has a strong tendency of losing it, thus becoming a positive ion; its nucleus is considered as the element of positive electricity and atomic weight, and is called proton. In oxygen the first ring is complete with two electrons, the second carries six and has two empty places. A strong tendency exists to fill these vacancies making oxygen a negative ion with the H-valency 2; therefore, it combines with 2 electrons of 2 hydrogen atoms. In helium the first ring is just completed, making helium an inert gas with no chemical affinity. The helium nucleus is one of the best stabilized nuclei and plays an important role, together with protons and electrons in the composition of the more com-

plicated nuclei. Chlorine used to be the best known example of an element for which the old Prout's hypothesis could not hold true. Nowadays it is proved that it consists of a mixture of 2 elements of the same electronic structure, with different atomic weights, namely, 35 and 37, in such a mixture that the total average weight of 35.46 results. Such mixtures are called isotopes, because they represent multiple elements which hold the same place in the periodic table. Lead, uranium and most radio-active elements are isotopes.

The atomic disintegration of radio-active elements is shown for 2 examples, (an alpha and a beta radiator). Ra, with 2 affinity electrons in the outer orbit is an alkaline earth with the oxygen valency 2. Its nucleus emits an alpha beam in a form of the helium nucleus, and thus loses 2 units of positive charge and 4 units of atomic weight. The new nucleus cannot neutralize all the electrons anymore and the 2 valency electrons are lost. The remaining element Ra Em, therefore, is an inert gas. The helium nucleus, coming to rest, surrounds itself with 2 new electrons establishing itself as a helium atom. Ra B is a lead isotope with a hydrogen valency of 4 on account of 4 vacancies in the outer ring. The nucleus emits an electron as a beta ray, and gains one positive unit. The outer ring takes up one electron for balance, and 3 vacancies

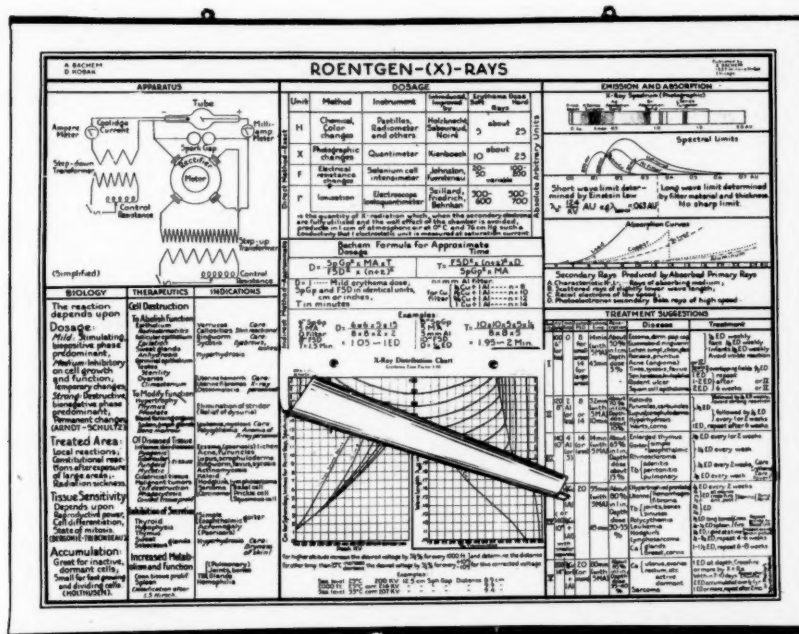


CHART III

only are left, making Ra C a Bi-isotope with a hydrogen valency 3. These examples explain the transformations which occur in the radio-active series by the emission of corpuscular *alpha* and *beta* rays. The *gamma* radiation is an ether disturbance caused by the inner atomic rearrangement.

The other parts of the radium chart are for direct medical use. The dosage chart (right side) shows the milligram hours required to produce a mild skin reaction. These figures are given for various radium and radon preparations, such as seeds, plaques, needles, tubes, for different distances and different filters. Only those factors as are commonly used are considered.

A radium distribution chart indicates the distribution of the radium rays inside of the tissue for 3 applicators, a surface plaque, a monel needle and a tube, filtered with 2 mm. brass or 1 mm. lead. For the last sample the important pelvic organs are entered in natural size for an average size patient. The part above the dotted line represents an anterior-posterior sagittal section, the part below a transverse section. The regular lines represent isodoses, i. e., curves connecting all points with identical biological reaction. The curve carrying the figure 100 indicates the region which has received an erythema dose. The tissue inside of this curve has received

more than an erythema dose, the tissue outside less. At 50 the tissue has received half an erythema dose, at 200 twice an erythema dose. This radium distribution chart can be directly combined with the x-ray distribution charts, supplementary to the Roentgen chart, because they are based on the same biological unit. If larger or smaller applications are made, all figures must be multiplied by the same corresponding factor. Thus for 4,000 mg. hours the biological effect would be 400 instead of 100, corresponding to four times an erythema dose.

The radon disintegration and accumulation chart shows two items, important for radon work: First, the gradually decreasing activity of radon for 30 days. The decrease is so pronounced in the first few days, that a second curve is given which indicates the decline for the first 120 hours, with 4 hours intervals. While the day figures are found on the bottom of the chart, the hour figures are seen on the top. Secondly, the cumulative dosage of one millicurie is shown. These figures are also given for hours and for days. After 30 days the cumulative dosage reaches closely to the final figure of 133 mg. hours, indicating that 1 millicurie radon left imbedded in the tissue applies as much energy as 1 mg. radium applied for 133 hours.

Finally the physiology and therapy is dis-

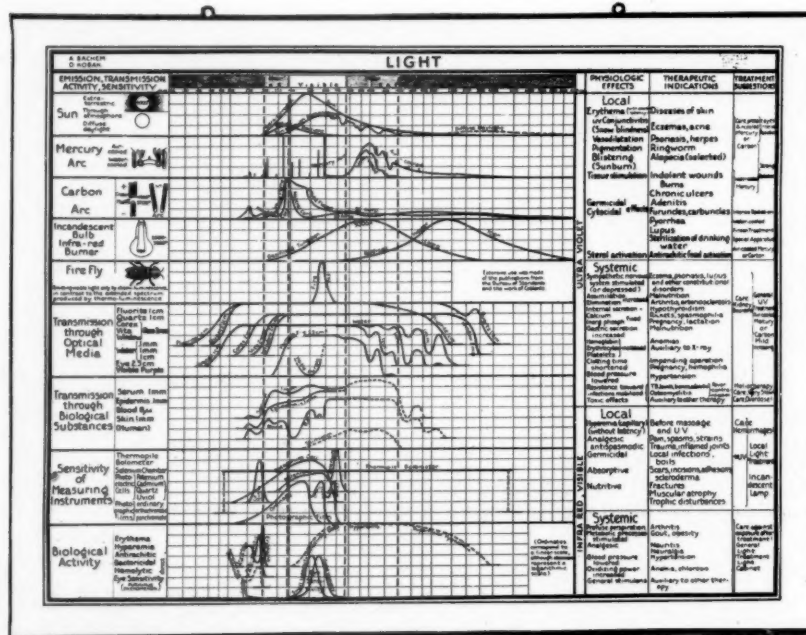


CHART IV

cussed for the various applicators. The relative importance of the *alpha*, *beta* and *gamma* rays is indicated by the relative size of the Greek characters. The local and general physiological effects are discussed for small and large dosage. The most common therapeutic indications are given in the last column of this section.

The third chart compiles the most important items about Roentgen (x-) rays (3).

The commercial x-ray apparatus is explained by a diagrammatic drawing in the upper left corner.

A photographic x-ray spectrum is shown in the upper right corner. From the left to the right we have the direct, unreflected x-ray beam, indicating the zero point of the wavelength scale; the short wave end of the continuous spectrum; the short wave emission lines, characteristic for Tungsten, known as the K series; the maximal optical density, corresponding closely to the greatest x-ray intensity λ maximum; two discontinuity lines, at which the density abruptly changes, on account of the selective absorption of the silver and bromine of the photographic film; the long wave Tungsten lines, known as the L series; and the gradual intensity decline toward longer waves. Several curves illustrate the spectral intensity distribution. The short wave limit depends only upon the kilovoltage.

According to Planck and Einstein it can be determined by dividing the constant figure 12.4 by the kilovoltage. The long wave limit depends upon the filter absorption and is not so well determined. The absorption curves of the most important filter and protection materials demonstrate the relative absorption coefficients and the characteristic absorption bands, at which the absorption suddenly decreases toward longer wavelengths, in contrast to the gradual increase with increasing wavelength.

The whole center of the chart is devoted to the practical determination of x-ray dosage. The direct method measures the produced x-ray output by the use of various arbitrary units or the new absolute "r" unit, which is based upon the ionizing power of the x-rays.⁽¹⁾

The indirect method makes use of a formula which permits the determination of the dose in a biological unit or the treatment time in minutes, if voltage, milliamperage, distance and filter are known. A few examples illustrate the use of a simple formula introduced by Bachem.⁽²⁾ The sparking distances of point and sphere gaps for 40 to 300 kv. are represented by a series of curves; the effects of altitude and temperature can easily be corrected by simple rules, illustrated by a few examples. The effective (average) wavelength of the radiation can be determined ac-

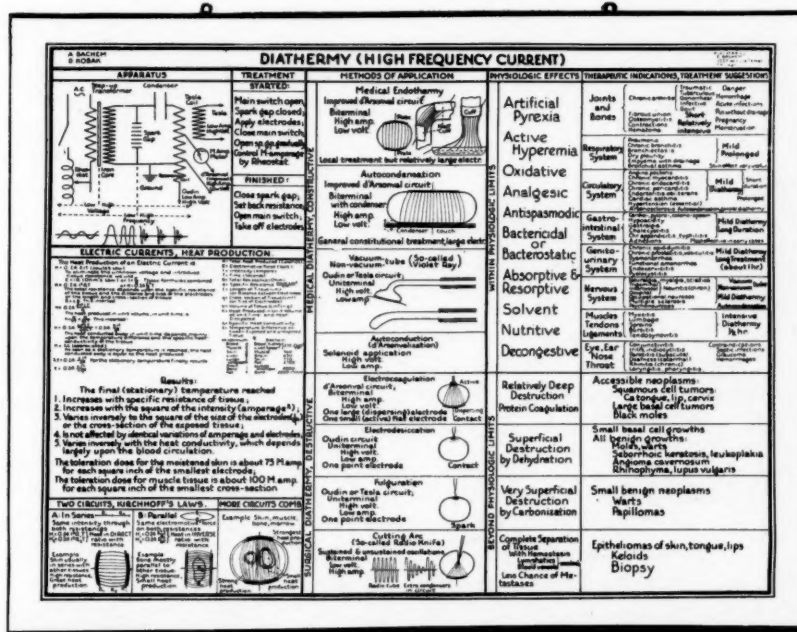


CHART V

according to Duane by absorption measurements for 4 mm. and 1 mm. cu. Duane's curves demonstrate this relationship and permit a direct determination of the effective wavelength with an electroscope.

A series of supplementary x-ray distribution charts can be attached to the center of the chart for use in deep x-ray therapy.⁽³⁾

Several important biological laws (Arndt-Schultz, Bergonié-Tribondeau, Holthusen) are explained in another section (lower left corner), and the various biological effects of the x-rays are coordinated with their therapeutic indications.

Finally a scheme is developed for the treatment of the various diseases (lower right corner). Five qualities of x-rays are described, from unfiltered radiation for skin treatments to heavily filtered radiation for deep therapy. The various diseases are distributed to these five qualities; other important items such as dosage, number of treatments, time interval, etc., are added. This section represents a prescription of x-rays, which takes into consideration the great multitude of variable factors.

Visible, ultraviolet and infrared light are covered by the next chart (4).

The spectrum on top of the chart compares the psychological scale of colors with the physical scale of wavelengths. The limits

of the visible spectrum are given as 390 and 770 $\mu\mu$ (millimicrons). The distinction of near and far invisible rays is of great physiological importance. Near ultraviolet and infrared still penetrates into the tissue and through many optical media. The far ultraviolet and infrared rays have very little penetrating power.

The spectral emission curves illustrate the spectral distribution of the various natural and artificial sources of light. The maximal intensity is represented by the full height of 4 lines (or 100 per cent) for every source. The sun spectrum outside of the atmosphere would have its maximum in the green, and the sun would appear whitish green on a dark sky. The atmosphere divides the sunlight into 2 components, the direct sunlight, which goes straight through the atmosphere, and the diffuse daylight, which after many reflexions reaches the observer from every angle. The longer waves preponderate in the first one and make the sun appear white, yellow or even orange red; the diffused light contains comparatively more short rays; for this reason we see the sky blue. It also contains very long heat rays caused by the absorption of the direct sunrays.

The spectrum of the mercury arc is composed of a continuous spectrum of long wavelengths and a discontinuous spectrum

(spectral lines) of shorter wavelengths. In the water-cooled lamp the greater part of the heat rays are absorbed by the water. The carbon light shows several pronounced bands, the strongest ones at the border of violet and ultraviolet. The incandescent lamps and radiant heaters have a broad continuous spectrum, the first ones with the maximum of penetrating rays in the near infrared, the second one with the maximum in the far infrared, where little penetration occurs. In contrast to these broad spectra, due to thermoluminescence, the spectrum of the light of the firefly, caused by chemiluminescence is so narrow that it extends only over 4 colors of the visible spectrum.

The transmission through various optical media and biological substances is shown by a series of curves. Nearly every curve has its own abscissa; the ordinates indicate the transmission, 25 per cent for each unit, 100 per cent for 4 units.

The sensitivity of various measuring instruments and the biological activities are given in the last two series of curves. The maximal sensitivity and activity is represented by 4 units or 100 per cent in every case. Estimated figures are indicated by broken lines. The fact that the total energy is measured and determined by the produced heat makes the curves of the heat measuring instruments a straight horizontal line.

The physiological effects, therapeutic indications and some treatment suggestions are given in another part of the chart; the actions of ultraviolet on one hand and visible and infrared on the other hand are studied separately while the physiological effects of both kinds of radiations are subdivided into local and systemic. By reading from left to right, through the dividing lines one gets the coordination of physiology, therapeutics and treatment.

The next chart (5) deals with high frequency and its application by diathermy. The commercial apparatus is demonstrated by a schematic drawing (left side) which distinguishes the various circuits, such as of low and high voltage, low and high frequency, and the various coils in use. Five important rules about the heating effects of electric currents are given and physically explained; quantitative figures of the specific resistance of tissues and tolerance doses are added. The

current distribution is taken up for two circuits, one with 2 resistances in series, another one with 2 resistances in parallel. Finally an example is shown with both circuits combined. The bones deviate the current and create a much greater current density in the surrounding tissues and a very small intensity in the bone and marrow; that part of the current, however, which is forced through the bone (or skin) produces a greater heat per current density.

The practical methods of application of high frequency are illustrated in the central section. All the various methods in use are considered as well for medical as for surgical diathermy. At the right side of this section we have the physiological effects, therapeutic indications, and some treatment suggestions, directly confronted with the technical methods of application, for instance the relatively deep destruction with electro-coagulation, the superficial destruction with electro-desiccation, the very superficial carbonization with fulguration, and the hemostatic tissue separation with the cutting arc. For medical diathermy the immense wealth of indications is given in a logical order.

The various electric currents are classified technically, physically, chemically, physiologically and therapeutically in the last chart (6).

Direct currents of low and of high voltage are distinguished from alternating currents of symmetrical and asymmetrical characteristics. This distinction finally leads to 5 different practical types of currents: Galvanic, static, faradic, sinusoidal, and high frequency. The production of the various currents is briefly described, and electrical characteristics are illustrated by curves, which indicate the magnitude and fluctuations of voltage (thin lines), and amperage (heavy lines).

The chemical and physical properties of the various currents are listed in the center column. Three principal effects are distinguished, chemical effects, ion concentration changes, and heat. The contact with the various currents is established by lines and arrows, for galvanic current and its chemical effects by a solid line; for the interrupted and surging currents and the ion concentration changes by broken lines; for high frequency and heat again by solid lines; finally those mild superficial effects are listed, as caused by mild chemical effects, mild air current,

[illegible]

CHART VI

mild heating, etc., and this part connects by dotted lines with the various effluves or brush discharges which produce these effects. Under chemical effects, we find polarity, ionic migration, electrolysis and iontophoresis listed and explained; from all these chemical effects arrows point to the various corresponding physiological effects in the next column, such as the positive and negative polar effects, drug diffusion, sterilization, etc., and finally to the therapeutic indications and treatment suggestions. The same principle is used for the other physical and chemical effects and their use in physiology and therapeutics. So for instance, in neuromuscular effects we have the single contractions, or tetanus, or no response at all, depending upon the frequency; in diathermy we have the destructive

effects, or the hyperemia, or the cutting effect, depending upon the concentration and the type of the current used.

In summarizing, this chart can be read vertically from top to bottom, in order to have the complete classification and description of the various currents and their effects. By reading the chart horizontally, from the left to the right, we have the logical explanation of the physical, chemical, physiological and therapeutic effects for every current variety.

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QUESTIONS AND ANSWERS

Q. When is massage indicated in the treatment of sprains and fractures?

A. Campbell (*Handbook of Therapeutics*) states: "In all sprains and fractures, the soft tissues are much damaged and there is a pouring out of blood and exudate which, if allowed to become organized, forms a patch of fibrositis, which may persist and cause permanent local weakness. It is wise, therefore, to commence massage *at once* by stroking the injured part gently and firmly, so as to remove the exudate, to improve the circulation locally, and thus promote healing.

Q. What aids can be derived from physical measures in non-union of bone in fractures?

A. According to Granger (*Physical Therapeutic Technic*) the basic points are:

"1. Secure adequate fixation. This is essential.

"2. Use diathermy. The lateral or anteroposterior application is the best. If this is impossible use the cuff method, which is less efficient and requires a longer treatment time.

"3. If there is a blood calcium deficiency, give general treatments with the air cooled ultraviolet, four positions, starting at one and a half minutes, twenty-inch distance, rapidly working the exposure up to eight minutes a position or thirty-two minutes in all. If the carbon arc, with "A" carbons, is used start at five minutes, twenty-four inch distance, in two positions, and work up to twenty minutes each, or forty minutes in all. If the case is of long standing give by mouth some calcium salt, at least fifteen grains daily. Give these treatments every other day. At the end of three weeks an x-ray picture should be taken as a check-up. Continue for at least nine weeks."

It is questionable whether prolonged exposures of ultraviolet with the air-cooled lamp accomplish any more than shorter exposures. Clinical experience has fairly well

demonstrated that when a patient requires ultraviolet, a maximum effect can be obtained by frequent treatments of short duration. An arbitrary direction would be treatments of ten minutes duration three times weekly. However, this is subject to modification depending on the condition of the patient and the progress made.

Whether calcium deficiency is influenced directly by ultraviolet irradiation has been challenged in some quarters. There have been some change of views since the publication of Granger's original work.

Q. What is the physical treatment of osteoarthritis?

A. Palmer (*Lessons on Massage*) writes: "Treatment is directed to the relief of pain, improvement of the blood supply to the joint, and prevention of all unnecessary intra-articular friction. To quote Dr. Osgood (*Orthopedic Aspect of Chronic Arthritis*," *British Medical Journal*, February 20, 1926): "The local therapeutic indications are to maintain and stimulate the blood-supply of the joint by heat and massage about, but not on, the chondro-osseous ridges, and by intermittent active, painless motion, but not by manipulation. First and foremost we must diminish in every way intra-articular friction." Dr. Osgood goes on to point out, "that the bony outgrowths at the articular margins are capped by sensitive cartilage which proliferates if irritated by friction, that temporary immobilization will not cause ankylosis in joints other than those of the spine and pelvis, and that protection from too much movement will allow the irritation to subside."

"To sum up the massage treatment:

"Effleurage, kneading, and petrissage should be given to the limb, but frictions on the articular margins of the joint may cause pain and irritation, and should therefore be avoided. If any movements are ordered, they should be active and performed within the limit of pain."

Q. What has been the experience with the use of radium in the treatment of ozena?

A. Some rhinologists in this country have had fair success in the treatment of atrophic rhinitis and ozena with radium. Its use on a large scale has not been generally adapted, first, because a radium supply is not always at hand, and second, because the technic of application requires special training on the part of the rhinologist. A recent article by Podestá and Arana [*Semana Medica*, 37:1820 (Dec. 11), 1930; ab. *J. A. M. A.* (March 14), 1931], deals with the bad results of radium applications in ozena. The abstract follows:

"Podestá and Arana consider radium therapy in ozena dangerous. The dose is not as yet definite and the application of a dose of radium larger than that which the tissues can tolerate may cause permanent deformities. Because of the atrophy caused by ozena in the tissues, the septum has been rendered thin. Besides that, the nasal cartilages are highly sensitive to the action of radium. If radium therapy is given to patients with ozena, the septal cartilage should be protected with proper filters. The same dose that may be only stimulative and beneficial to some of the tissues may cause extensive necrosis and large perforations in the septum, either as immediate or as late results. The authors report that case of a woman, aged 22, with ozena of neither syphilis nor tuberculous origin. While receiving the treatment the patient developed regional symptoms which compelled discontinuation of the treatment, after she had received a total number of six applications of radium of seven hours each, once a week. The bad odor of the nose disappeared in this case, though the crusts persisted. The examination of the patient showed, besides a condition of atrophic rhinitis of an ozenous origin, the presence of a large perforation of the septum which did not exist before the applications of radium and which proved to be caused by radium therapy. Though the literature contains few case reports of this kind, the authors were able to find similar bad results reported from radium therapy in ozena, such as the causation of permanent fistulas in the nose, or large perforations in the hard palate. They consider

it advisable to publish reports of patients who received treatment a long time ago, in order to set the right value on the results of the treatment."

Q. Has ultraviolet irradiation been used in the treatment of angina pectoris? What results have been obtained?

A. An interesting report which fully answers these questions is contained in the November, 1930, issue of the *British Journal of Actinotherapy and Physiotherapy*. Freund, the author, calls attention to the fact that Hasselbach and Jacobaeus were probably the first to apply ultraviolet for angina pectoris. Their paper was published in 1907, in the *Berliner Klin. Wochenschr.* Twenty-eight cases were successfully treated by them.

Freund stresses that the modern mercury quartz lamp has made possible further progress with ultraviolet for conditions which require strong erythema to favorably influence them. The duration of exposure at the first treatment is usually 10 to 12 minutes at 80 cm. This is gradually increased although the matter of dosage must be worked out to suit each individual. This applies also to the number and frequency of treatments.

With reference to results, Freund writes:

"In slightly over one-third of the cases, the treatments were very successful; another third showed distinct improvement, if nothing more; some cases showed no improvement. Treatments have lately been distinctly more successful, probably owing to greater experience and improved technique. It must be admitted, however, that in many cases improvement is not final, even if it sometimes persists for many months. A patient who suffered from pronounced angina pectoris ambulatoria was treated by me three years ago and has since been practically free from complaints. The change came about during the course of irradiation. While still under treatment he improved sufficiently to be able to walk for 1½ hours without inconvenience. He has since felt slight twinges on rare occasions, when exposed to cold, but for the last 18 months has been able to dispense with nitroglycerine. Many of our patients say they found it possible to do without (or with less) nitroglycerine after the first few treatments."

THE STUDENT'S LIBRARY

BOOK REVIEWS

AMBER TO AMPERES, *The Story of Electricity*. By *Ernest Greenwood*. Cloth. Pp. 332, with illustrations. Price, \$4.00. New York: Harper & Brothers, Publishers. 1931.

Electricity is today playing the most important part in the mechanization of our civilization, probably more than any other single influence in our times. Indeed, the uses of electricity are today so widely distributed that every walk of life has become dependent upon it for comfort and even for sustenance. Future generations will speak of our period as the age of electrification because of our intense application in harnessing its powers.

The present volume is a recital of the influence of electricity on our civilization. It is the story of that mysterious entity with antithetical properties, described by Zosimus, the alchemist, as "a precious thing which has no value, a thing of many shapes which has no shape, this unknown which is known to all . . . its kind is one, its species multiple. All comes from the one and all returns to it." The author has described the progressive steps in the growth of our knowledge of electricity in a non-technical style. He has chosen his material from authoritative sources and has clothed his subject with such fascinating and dramatic personalities that the perusal of this book takes on the same experience as when reading the story of the most enthralling adventures. The entire story of electricity, from its earliest discovery to the great modern electrical age, is unfolded here, in terms of the men who have made its use so vital to us all. The story glows with great personalities: Thales, Bacon, Da Vinci, Franklin, Galvani, Volta, Watt, Faraday, Gilbert, Hertz, Ampere, Crookes, Morse, Bell, Edison, Roentgen, etc.

A chapter is devoted to the influence of electricity in modern medicine. The author selected the Beth-Israel Hospital, in New York, under the directorship of Dr. Bierman, as a cross-section of the modern adaptation of electricity in therapeutics. The description of his impressions are very interesting but entirely too short. Although it has its dramatic points for the lay reader, the medical man no doubt will find this part entirely too inadequate. It seems that a better balance could have been struck if the author had planned his work to consider the influence of electricity from both the economic and medical aspect. One has the feeling that the author should have taken greater advantage of this opportunity—an opportunity that would have satiated the readers' hunger for scientific information on both sides of the subject.

Two other features of interest are the well selected bibliography and the index. There is no doubt that most readers of this book will seek further inspiration from the source references appended at the end of the volume. The story of electricity is

always interesting particularly when written in a style, as this one, that holds one's interest from the beginning to the very end. To the physician practicing the newer advances in physical therapy, this book will be of particular interest.

MUSCULAR CONTRACTION AND THE REFLEX CONTROL OF MOVEMENT. By *J. F. Fulton*, B.Sc. (Harvard); M.A., Ph.D. (Oxon). Cloth. Pp. 644, with 215 illustrations and tables. Baltimore: The Williams & Wilkins Company. 1926.

The present work offers one of the richest and scholarly evaluations of the nature of muscular contraction and the reflex control of movement that has recently been summarized within the scope of a single volume. The author, one of the outstanding physiologists of our time, is not only richly endowed with an unusual orientation in his chosen field, but he has that rare facility of presenting the intricate theories connected with the subject in a style easy to comprehend.

The subject matter is divided into two parts: (1) "The Nature of the Contractile Response of Individual Skeletal Muscle Fibres," and (2) "The Nature of the Integration Control Exerted by the Central Nervous System Upon Skeletal Muscle Fibres in the Performance of Movements and in the Maintenance of Postures." The first chapter is a splendid historical introduction of the outstanding contributions and pioneers of the subject. In this historical review there is discussed the "use of electrophysiology," the history of thermodynamics of muscle together with a "chronological list of the important contributions to the physiology of muscle." The succeeding chapters consider in detail the essential factors of the electrical excitation of muscle, the variation of excitable muscles, the various theories associated with the action of electrical stimuli, and the theory and significance of the excitation-time characteristics (chronaxie) of irritable tissue. A very useful innovation and one seldom found in modern text is the introduction of a concise summary of the arguments at the end of each chapter. This, together with the extraordinary bibliography attached at the end of the book, gives the student an extensive opportunity for collateral reading and evaluations of the essential points brought out in the work.

Although the facts connected with the subject are in many instances highly technical and, no doubt, were intended for the more highly specialized students in physiology, it also has a practical value for those who constantly make use of the various forms of electrical currents for therapeutic and diagnostic purposes. No other modern book has so thoroughly covered the features of the physiology of muscular contraction and reflex control movements as has this contribution. And it must be

pointed out that no other specialty in modern medicine is today making greater use of electrical stimulation in functional disturbances of muscles than is physical therapy. To that ever increasing group of specialists this book should have the widest appeal, for it offers that essential information necessary for complete orientation with his work.

DIE RÖNTGENSTEREOSKOPIE IHR WERT UND IHRE VERWERTUNG. By *J. van Ebbenhorst Tengbergen*, and *L. E. W. van Albada*. Paper. Pp. 143 with illustrations. Price, RM. 16.60. Berlin: Verlag von Julius Springer. 1931.

This work represents a serious and rather technical treatise on the whole problem of stereoscopic vision, with detailed consideration of the mathematical and physical calculations involved.

A chapter is devoted to stereoscopic photography and radiography, and the measurement of objects by means of stereoscopic films is discussed in detail. Orthoroentgenoscopy and teleroentgenography are described and discussed. There is included a critical discussion of the elaborate method of Dioclès.

One chapter is devoted to plastic radiography. Stereoscopic fluoroscopy is also dealt with. A particularly interesting chapter deals with the use of moving pictures in radiography and considers the possibility of developments along the line of television.

The book is well illustrated and well printed, and will be appreciated by those desiring detailed and accurate information on this subject. A short bibliography and index makes the book a well rounded out contribution.

PHYSIOLOGICAL CHEMISTRY: A TEXT-BOOK AND MANUAL FOR STUDENTS. By *Albert P. Mathews*, Ph.D., Carnegie Professor of Biochemistry, The University of Cincinnati, Fifth Edition. Cloth, Pp. 1233 with illustrations. Price, \$7.00 net. New York: William Wood & Company. 1930.

The average student goes through the cycle of his education by forced direction. On graduation he immediately discards all academic restraints and proceeds to forget the things he so laboriously attempted to remember during his novitiate period. The pages of the foregoing work sharply recall the interesting experiences in the laboratory of physiological chemistry and the heavy moments when "cramming" was part of the student's midnight responsibility. When the labor of undergraduate work is finally rewarded by admission into the licensed ranks of medical practice much of that which was forcibly learned is soon dissipated and quickly forgotten. Mediocrity is the average reward of those who have persistently avoided the enlightening and refreshing inspirations of the classics in medicine.

Mathew's work in physiological chemistry represents one of the most scholarly and classical expositions on the subject. It contains that unusual quality of simple lucidity so infrequent in works associated with topics of a like nature. It has that facile quality of vivid expression which adds fascination to a subject usually devoid of interest to all

except those specializing in the subject. In spite of the fact that the book makes apparently no attempt to cater to the general practitioner the lucid style and the graphic exposition voluntarily stimulates his interest. Indeed, the reading of this volume is suggested to that very group because of the pertinent and important information incorporated in this work. The present edition has brought down to date a digest of the advances made in the field of vitamins, the internal secretions, the carbohydrates, the porphyrins and the bile pigments, the bile salts, enzymes, and the synthesis of the important isoprene or polydiene. The progressive physician will discover this book to contain information of great value to him. It will help explain many puzzling situations encountered in the care of the sick. It will awaken old interest in the most fascinating speculation of all time—Life, Death and the changes associated with their physiologic activities.

THE COSMETIC TREATMENT OF SKIN COMPLAINTS. With Special Reference to Physical Therapy and Scarless Methods of Operation. By *Professor E. Kromayer*, second edition, Berlin. Cloth. Pp. 110 with 7 illustrations.

The author of this small brochure has long been considered as one of the distinguished authorities in the treatment of skin affections. The present work "represents," as stated by the author, "the fruits of thirty years' observation, examination, experiment, and discovery in the field of cosmetic dermatology. It, therefore, possesses a personal character and lays no claim to be a text-book in the usual sense of the word. I venture to hope, however, that this very peculiarity will render it a good counsellor in the multitude of bewildering anomalies and complaints encountered in the field of cosmetics."

The material is compiled into 34 chapters, with references and an index. Every phase of treatment is herein considered for each specific condition. The author evaluates the benefits to be derived from medication, caustics, electrolysis, heat, light, x-ray, radium, and special surgical instruments, described as rotary knives and special burrs, that produce scarless healing effects. For example, hypertrichosis, or superfluous hair, is considered as one of the many trying affections that often confronts the practitioner. The patient is usually hypersensitive to her condition, a circumstance that makes her one of the most difficult types to manage. The author sounds a warning note against the use of x-ray in these cases. He describes his own method of utilizing electrolysis and suggests the use of special shellac insulated needles for these cases. He also indicates when treatment is to be interrupted and explains the signs of the beginning of over-treatment.

The book is filled with rich suggestions—suggestions that contain the greatest practical value to the average and special practitioner. Many blank spaces in our therapy can well be gapped over in connection with cosmetic dermatology by adopting the many practical hints contained in this small volume. We are gratified to note that the work has been translated into the English language and we

feel certain that the present edition is bound to be exhausted in short order. This book should be in the hands of all general practitioners because of the rich suggestions contained therein.

ENERGY AND POWER. By *Morris Meister*, New York Training School for Teachers' College of the City of New York. Cloth. Pp. 238 with 175 illustrations. Price, \$1.08. New York: Charles Scribner's Sons. 1930.

The criteria of a successful book can be determined by the clearness with which the subject matter is presented, the unity of the exposition, the logic of the argument, and the interest that it awakens in the reader to the point that he will follow the author's thoughts to the very end. Simple writing is probably the most difficult writing. The author who attempts to express himself in the most lucid manner usually encounters the heaviest labor. Nowhere is the need for clear and simple expression more indicated than when addressing one's thoughts to the pupils in the lower grades.

The present volume is dedicated to the younger and immature generation because it presents the elementary facts of "Energy and Power" in a lucid and, so-to-speak palatable form. As stated in the foreword, "The subject matter included is the result of a careful study of a large body of scientific material. Numerous courses and textbooks in science were examined for worthwhile content. In accordance with definite criteria, each item of science content considered was evaluated numerically by five experienced teachers whose judgment was given after they had held many conferences and after they had made a close study of 130 replies to a questionnaire sent to teachers of elementary science in New York. From this somewhat objective method of selection, a body of highly educational content emerged . . . and the same subject-matter the author has developed into a textbook. . . ."

The author has unconsciously contributed a work that fills a need for those members of the medical profession specializing in physical therapy who have long been away from the contact of the latest or even the classical theories and facts concerning "Energy and Power." This book will therefore appeal to those who have long been removed from the highly mathematical discourses on this subject, and no doubt would prefer again to be introduced into the nature of energy, light and power by the non-mathematical and the elementary methods adopted in this work. Those who will read this book will feel themselves sufficiently rewarded by the generous information obtained from this work.

SELECTED READINGS IN THE HISTORY OF PHYSIOLOGY. Edited by *John Farquhar Fulton*, M.D., Sterling Professor of Physiology, Yale University. Cloth. Pp. 317 with 61 illustrations. Price, \$5.00. Springfield: Charles C. Thomas, Publishers. 1930.

The task of collecting and editing original sources

in Physiology may have been suggested, as the author states, by Long's similar effort in the field of pathology, but it is certain from the perusal of this work that no other source book has fulfilled its obligations with a more scholarly orientation on the subject. The book contains a collection of the extracts of original contributions of the outstanding discoveries in the field of physiology. Each selection is preceded by a brief historical sketch of the author and his contribution, and gives the reader that desirable personal and intimate contact as to make further reading an interesting task.

The material has been so arranged as to fall into a definite classification in accordance with anatomical sequence. For example, the first chapter deals with *General Principles*; the succeeding chapters with a consideration of *The Circulation of the Blood*; *The Capillaries*; *Respiration*; *Digestion*; *The General Nervous System*. The subject matter covered in these selected readings, therefore, ranges over a wide field. It includes some of the most fascinating and inspiring examples of physiological research that have been contributed to this modern branch of biological science. There are, altogether, 87 selections of source reference to the book. The authors coupled with these contributions probably make up as inspiring a group of names as was ever gathered together in a single volume of this nature. The inclusion in this list of quite a few of the living scientists may raise the question of the wisdom of such frank homage. Science has long been accustomed in a figurative sense to place its laurel wreaths on the tombstones of its departed leaders rather than upon those who are still alive. This departure in custom is somewhat startling at first glance, yet it is gratifying to find someone independent enough in his opinion to disregard old established habits. Taken at random we find such outstanding names as Helmholtz, the brothers Weber, Johannes Müller, Galvani, Galen, Lapique, Brown-Sequard, Rudolph Magnus, Magendie, Spallanzani, Pavlov, Bayliss, Malpighi, Harvey, etc.

A book of this nature has long been needed to bridge the gap between the average dull and monotonous type of text in physiology. Its purpose, as the author hopes, is to awaken new interest and to make more interesting that period of the average medical student's formative experiences in physiology. "For many reasons," asserts the author-editor, "it is desirable that a medical student be conducted early in his career to the front line trenches of medical and physiological discoveries. Let him realize that men as young as himself have made important contributions: that de Graaf at 23 years of age devised the first pancreatic fistula; that Helmholtz at 24 measured for the first time the hear production of frog muscle; that Johannes Müller at 25 had enunciated the principle of specific nerve energy." The present volume, therefore, is a splendid method and an easy road to first hand information. It has been written in a style that captivates one's attention and holds one's interest. The publisher is also to be complimented for the splendid physical make-up of this volume.

INTERNATIONAL ABSTRACTS

Influence of Ultraviolet Rays on Elimination of Uric Acid. A. Cabitto.

Riv. di Clin. Ped., 29:89 (February), 1931.

Cabitto concludes: In a child on a purine diet the application of ultraviolet rays does not cause notable changes in the urinary elimination of uric acid. In children on a non purine diet and given treatment with small doses of ultraviolet rays applied to the whole surface of the body, the elimination of urinary uric acid increases notably after each application, the increase remaining evident for several days. In the twenty-four hours immediately following the application, there is sometimes a moderate lowering of the value of the urinary uric acid, which changes rapidly during the succeeding twenty-four hours, reaching values sometimes double the normal value. The elimination curve of the urinary phosphates follows precisely the elimination curve of the uric acid. Since the uric acid is the expression of nuclear metabolic activity, the increase in the elimination of uric acid observed by the author in all cases studied is doubtless ascribable to an action of ultraviolet rays on the nucleus. The author assumes that this increase is to be attributed to an excitation of the nuclear metabolic activity and not to a destruction of nuclei.—*Ab. J. A. M. A.*, 96:1919 (May 30), 1931.

Das Elektrische Schneiden Mit Der Diathermieschlinge Bei Kleinen Chirurgischen Eingriffen. (Electric cutting with the diathermy loop in minor surgery). W. Wucherpfennig.

Der Chirurg, 1930, Jg. 2, H. 7 (April), p. 300-308.

This procedure was used by the author in basal cell and spinocellular carcinoma, ulcers due to roentgen rays, in naevi pigmentosi, fibromata, atheromata, condylomas, furuncles and rhinophyma. Exploratory incision for biopsy purposes is another field of application for the loop, though in this respect stress must be laid upon the manner of cutting the part so as to obtain specimens that will facilitate the best interpretations of the prepared sections. In contradistinction to Dyroff and apart from abdominal operations and other interferences which requires suturing the author recommends the open healing of wounds caused by diathermy loop, the cure occurring under daily renewed dressings with a two per cent pellidol-zinc-paste. Occasionally there may appear cheloid like induration toward the end of the healing of such a wound; the wound and its surroundings are irradiated with 400 R through 2 mm. Al shortly before the epithelium has completely closed, thus obtaining excellent cosmetic results.

As regards its influence on hemostasis, larger vessels should be ligated en masse or separately, medium-sized vessels crushed with the annular

compressor and coagulated at their opening; when one has to deal with small vessels, it is sufficient to slightly touch and thereby seal the region by the coagulation button. By this kind of hemostasis an ideal survey of the operating field can be established.

Ohrensausen Und Seine Behandlung. (Tinnitus aurium and its treatment). A. Zimmermann.

Fortschr. d. Ther., 1930, Jg. 6, H. 8 (April), p. 225-232.

Subjective noises can be influenced and notably increased by various external and internal conditions. The history of the case is of utmost importance in that it directs attention to previous affections, detects developing pathologies (otosclerosis, syphilis) discovers abuse of certain medications (quinine, aspirin) or excessive indulgence in alcohol, tobacco and offers a better insight into the general constitution of the patient. The treatment of the subjective noises is upon the whole a casual one. But where the ear or system are not affected or, if present, not susceptible of improvement, purely symptomatic treatment should be resorted to. It can, of course, also be used as coadjuvant of the causal therapy. Pneumomassage of the tympanic membrane belongs to the methods of local treatment. Occasionally it produces transitory improvements. The application of the direct current occasionally renders valuable services in the treatment of subjective noises. The success depends on careful selection of the method. All irritative factors should be avoided in connection with treatment of nerve irritability. Care should be taken to avoid sudden fluctuations of the current flow and sudden interruptions. The anode is placed directly before the tragus, the cathode on the nape of the neck or fixed to the arm. The current should be cautiously increased and decreased. The strength of the current to be chosen should amount to from 2 to 5 milliampères; individual exposures to be from 1-3-5 (at most 15) minutes and the total of exposures a week to about three. Favorable results were in some cases also obtained by the local application of the Sollux-lamp, the mercury vapor quartz lamp, the Finsen and carbon arc lamp. In addition to the methods of physical therapy medicinal treatment should, of course, be administered as well as observation of acoustic progress. One should also attempt to find out if the condition is not due to some psychic trauma, such as sorrow or worries.

The use of brine baths is contraindicated, as they mostly excite the vasomotor apparatus and consequently increase the subjective noises. Empirically also cold baths, especially cold sea baths, cold affusions of the head and so-called cold water cure are contraindicated. Patients with subjective noises do well in Alpine health resorts at high altitudes

or in woody mountainous regions of medium altitudes (not over from 600 to 1,000 meters) are best.

Eine Einfache O-Bein-Bandage. (A plain bandage for bow legs). Josef Wolf.

Zeitschr. f. orthop. Chir. 1929, vol. 51, p. 97-98.

Owing to the knee-free fashion of modern female dresses, physicians are now frequently consulted by young women for bow-legs of slight degree for the purpose of correcting this cosmetic deficiency. In such cases a simple expedient has given the author satisfactory results. The side contours of the leg are determined by the musculature, viz., the peronei and gastrocnemii muscles. This muscle tube can be pushed inward past the tibia from behind. When this is done on a flat-arched crus varum, an inspection from before or behind shows the outward arch to be flattened and the inner one filled in by the musculature of the calf rotated inward. If one succeeds in maintaining this inward rotation, the bowed leg appears to have vanished or at least the incurvation much flattened.

A simple bandage solves this problem. The bandage is made up of india rubber, about 8 cm. in width; a ring is provided with push buttons and two ears at its outside and tightly applied immediately above the ankle joint. A second somewhat wider india rubber ring surrounds the leg where its circumference is widest. To its posterior aspect an elastic bandage is fastened measuring about 3 cm. in width supplied with two hooks at its ends. The patient applies the bandage, so as to fasten first the inferior, then the upper elastic bandage, while the other hand is turning the calf musculature inwards and in this position conducting the strained elastic bandage in spiral turns from the posterior aspect of the leg past the internal and anterior aspects downward as far as the outer aspect of the inferior bandage and hooking it there. If an elastic stocking covered by an ordinary one is worn over this bandage, made of white or pink material, the inequalities of the bandage level disappear, thereby presenting a leg quite or approximately correct.

Die Behandlung Akuter Entzündungen Mit Niedrig Dosierten Roentgenstrahlen. (Treatment of acute inflammations with small doses of x-rays). A Viethen.

Jahrbuch für Kinderheilkunde, 122:284-301, 1929.

About 200 cases of acute purulent inflammations in infants and children were treated by small dosages of x-rays. The results obtained were for the most part very favourable. In erysipelas the disease cleared up completely in 8 cases after irradiation. Good results were also noticed in acute inflammations of the lymph nodes. Fresh inflammations responded best. In a series of cases only a single irradiation was administered but was not sufficient; it was necessary to repeat it after a few days.

The reaction in phlegmonous affection was very good, but particular caution as to the dosage is to be observed here.

Favourable results were obtained in furuncles,

skin abscesses and in purulent mastitis. Osteomyelitic processes are best irradiated after the operation. Purulent inflammations arising in the course of scarlet fever were made to clear up by the irradiation.

The author definitely emphasizes that greatest caution should be taken in regard to dosage. The largest single dose for children should be 10 per cent of the skin unit dose for the skin surface. In severe diseases of the children and young infants it is advisable to split the dose into two fractions. In connection with pus infections, drainage should first be established (prick incision, puncture). Processes which are apt to become dangerous because of the purulent nature of the condition, should not be irradiated. Hard rays and heavy metal filters are recommended.

Roentgenbehandlung Klimakterischer Störungen. (Roentgen ray treatment of climacteric disturbances). J. Solomon.

Med. Welt, 19:682 (May) 1929.

There are many women who at the onset of menopause are seized with more or less severe metrorrhagias. The etiology of these haemorrhages is rather complex. According to some authors they are caused by endometritis, whereas other investigators believe them to be due to abnormal conditions of the ovaries. Whatever pathogenetic theory may be claimed, at all events this much has been established that roentgen ray therapy is particularly indicated in metrorrhagias of the menopause if not due to neoplastic affections. In cases with feeble haemorrhages one can attempt to control them by irradiating the spleen. If this irradiation gives insufficient results, then the author irradiates the uterus and ovaries with the same technic as in myomata: irradiation of two fields, the one below the pubic bone, the other above the coccyx, 250 R per field, two exposures a week up to a whole dose of 2,000 R per field (the dose being spread over from 4 to 5 weeks). The author states the results to be excellent. The percentage of cures approaches 100 per cent.

Experiences with Roentgen Irradiation in Hypertrophy of Prostate. H. Boit.

Den. Med. Woch., 57:349 (February 27), 1931.

Boit employed roentgen irradiation in 114 cases. Before each irradiation the bladder is evacuated and this is followed by irrigation of the bladder and of the intestine and by intravenous injection of 10 cc. of a 50 per cent solution of dextrose. The rays are applied with a tube of 6 by 8 cm. on three fields on successive days. The first field is irradiated from the perineum, while the patient is in the dorsal position, the second infracoccygeally between the tip of the coccyx and the anus, the third suprasymphyseally. On each field 80 per cent of the unit skin dose is applied. The filter consists of 0.5 mm. of zinc and 1 mm. of aluminum, and each irradiation lasts nine minutes. The testes are covered. During the irradiation of the first and third fields the focus distance is 30 cm.; during the infracoccygeal irradiation, the tube is pressed between the nates. If necessary, a second series of

irradiations is applied after four weeks. On the basis of his experiences the author reaches the conclusion that this form of roentgen treatment is the method of choice in all inoperable cases of adenoma of the prostate. Roentgen irradiation gives favorable results also in the first stage of adenomas of the prostate and also in acute retention. More than four or five roentgen series are not advisable because a stenosing fibrosis might develop.—*Ab. J. A. M. A.*, 96:1919 (May 30), 1931.

Zur Physiologischen Begründung Der Armbaeder Nach Hauffe. (Contribution to the physiological rationale of Hauffe's arm baths). J. Mintz and A. Kiritschinsky.

Ztsch. f. d. ges. physikal. Ther., 1929, Bd. 38, H. 2, (Dez.) p. 47-62.

Hauffe considers partial baths with gradual increase in water temperature as the most convenient hydrotherapeutic procedure. It is, moreover, of no consequence which part of the body is exposed to these gradually increasing thermic stimulations; it is only the size of the irritated surface which is of importance, and from this quantitative point of view Hauffe distinguishes foot, arm and sitz baths. He sees in them advantages in carrying out the proper dosage as well as simplicity of technic. The authors have used these partial baths extensively in hospitals. One observes within a short period of 5 or 6 minutes, the temperature being raised from 38 to 39 degrees C, one sees a reddening effect of the immersed part. At the eighth to fifteenth minute perspiration appears on the bare and (later) on the covered parts of the body. Blood pressure is lessened after each bath by from 5 to 15 mm, whereat it was mainly the systolic pressure which showed a recession. In individuals suffering from congestions of head and face (menopause) distinct improvement was seen as soon as after the fourth or fifth bath. In some cases the authors saw a narrowing of the boundaries of the dilated heart from 1 to 1½ cm. In a few patients dyspeptic manifestations and pain in the cardiac region disappeared. Upon the whole Hauffe's partial baths were beneficial in conditions associated with increased irritability of the vegetative system (vegetative-endocrine diseases) and in conditions where it is necessary to spare the cardiovascular system associated with changes in the blood-pressure (organic affections of the heart and vessels). The effect of these partial baths of Hauffe is to be ascribed to the dilatation of the vessels of the peripheral system. The authors, however, believe that the effect is due to the stimulation of sensorio-vegetative reflexes.

Case of Tonsillar Lymphosarcoma Treated with Diathermy Knife. Hallas.

Hospitaltid. Dansk. otolaryngol. Selsk. Farthandl. 73:36, 1930.

Hallas presents a case which shows the importance both of biopsy and of the Wassermann test. A man, forty years of age, had complained for fourteen days of a thickening and a lump in his throat. The right tonsil was the size of a walnut, with a large dirty ulceration on the medial side.

The tumor was movable; there was no glandular swelling in the neck. Biopsy was done and a histologic diagnosis of lymphosarcoma was made. The tumor was extirpated under chloroform narcosis with a diathermy knife. Recovery was smooth.

On the day of the operation the Serum Institute reported that the patient had a strongly positive Wassermann reaction and, after constantly denying luetic infection, he finally admitted that twenty years before he had undergone treatment for syphilis. The tumor was re-examined and the original diagnosis confirmed. The patient was later given x-ray and anti-syphilitic treatment. There were no signs of recurrence.

Sarcoma of the tonsils has a relatively good prognosis among the malignant tumors of the tonsil; that is, if diagnosed early. Unfortunately, early diagnosis is not common. The author believes that the present patient has good chances for a complete cure. He considers that the possibility of recurrence is diminished by using the diathermy knife instead of ordinary surgical methods.—(*Am. J. of Cancer*, April 1930.)

Surgical Diathermy in Diseases of the Nose and Throat, Especially in Malignant Tumors of these Organs. Walter Hesse.

Deutsch. med. Wochenschr., 56:1479, 1930.

After a historical review of the origin of surgical diathermy, Hesse describes in detail his technic, including the unipolar and bipolar methods, types of electrodes, etc., as well as the method of application to different tissues. He cites as advantages of the method: (1) the thorough coagulation of the tissue, sealing the blood and lymph vessels, and thus preventing migration of pathologic cells and hemorrhage; (2) the depth effect, involving in suitable areas the surrounding healthy tissues; (3) the comparatively slight reaction after coagulation.

The method was applied chiefly to malignant tumors of the nose and throat and, where indicated, was combined with open surgery. In summarizing his results, the author states that surgical diathermy has "given good results in small malignant tumors of the larynx when combined with open surgery. However, in extensive tumors of the larynx we have used radical laryngectomy. With respect to tumors of the accessory nasal sinuses, there was usually present a growth which could no longer be radically removed. In such cases even surgical diathermy cannot accomplish the impossible, since the depth effect has to be restricted on account of adjacent vital organs. Better results were attained in the less extensive tumors of the antrum of Highmore not involving the dura. After all, the chief necessity is early treatment of these malignant tumors. Naturally early diagnosis is difficult and frequently tumors of the ethmoid region have involved the dura before the patient consults the physician. In papilloma of the larynx no special success was had with diathermy. As previously mentioned, open surgery and diathermy of the operative field are usually combined, so that due credit for success must be given to surgery, also. However, sealing up the lymph and blood tracts by coagulation, which should involve some of the healthy tissue where possible, and preventing metastasis

through tumor cells, justify attributing part of the success to surgical diathermy. The method is certainly a valuable addition to the therapy of tuberculosis of the nose and throat and malignant tumors of these organs. Surgical diathermy does not dispense with the early diagnosis nor with the necessity of surgically removing a malignant tumor as widely as possible; yet it offers a special guarantee—coagulation of the operative field after open surgery—and it can be tried in otherwise inoperable tumors, where it usually results in temporary improvement, though not cure."—(*Am. J. of Cancer*, (April 1930).)

Diathermocoagulation in the Treatment of Cutaneous Cancers. L. Daniel, J. Lamblin, and P. David.

J. d. sc. Méd. de Lille 48:141, 1930.

The authors describe their technic of diathermocoagulation which they believe to be the method of choice in the treatment of cutaneous cancer. They also describe the reaction and sequelae following the treatment, and cite 13 cases. Seven were recurrent epitheliomata which had been treated previously by various methods, including radiotherapy, electrolysis, curettage and arsenical paste, and surgical extirpation; the remaining 6 were treated at the outset by diathermocoagulation. All these cases are described as being cured by diathermocoagulation, although the interval elapsing in several would hardly justify such a conclusion. The authors summarize the advantages of the method under the following headings.

(1) The cosmetic results, which are of especial importance in neoplasms of exposed portions.

(2) The simplicity of the technic, the cleanliness of the operation (no hemorrhage), and its rapidity. A tumor the size of a two-franc piece can be destroyed in a few seconds without general anesthesia.

(3) The rareness of recurrence. The authors state that they have never seen recurrences in lesions treated solely by this method. The method is also very efficient in recurrences after treatment by other means.

(4) The applicability of the method in all varieties of cutaneous cancer, as spinocellular cancer, nevo-carcinoma, etc., which are more or less resistant to radiotherapy.

Finally it is stated that the method is also of value in various other skin conditions, as lupus vulgaris, tattooings, tuberculosis, verrucosus cutis, varicosities of the face, chancroidal buboes, tuberculous buccal ulcerations, and angiomas.—(*Am. J. of Cancer*, April 1931.)

Dosierungsfragen Bei Der Ultravioletttherapie. (Question of dosage of ultraviolet therapy). Kurt Kirschmann.

Klin. Wochenschr. 44:2055, (October) 1929.

The effect of ultraviolet light is primarily dependent upon the dosage and its regulation. The author classifies the dosage into several groups. The first is the mild reaction, i. e., one obtained by exposures from $\frac{1}{2}$ and $\frac{3}{4}$ L. E. D. (light erythema dose) which produces quite a feeble or fugacious erythema. The second group comprises a dosage

between 1 and $1\frac{1}{2}$ L. E. D. which provokes a distinct erythema ascertainable after 24 hours. Strong doses (the third group) are represented by from 2 to $2\frac{1}{2}$ L. E. D. which produce an intense, prolonged erythema. Finally one can administer very strong doses (fourth group) of 3 L. E. D. This produces the maximum reaction which the skin can tolerate and is associated in many cases with signs of desquamation and partly bullous dermatitis in tuberculosis of the lungs as well as in surgical tuberculosis. Careful individual dosage is especially necessary in tuberculosis of the lungs as well as in surgical tuberculosis in order to prevent harm and to insure the greatest benefit possible. In tuberculosis the individual sensibility and the influence of the rays should be continuously followed. In this respect the temperature graph and blood picture are the most reliable criteria. Rise of temperature or irritation phenomena in the blood picture require the reduction of the dose, especially in pulmonary tuberculosis after hemoptysis. Progressive cases associated with higher fever are to be excluded from ultraviolet therapy. Exudative forms, however, and cases with subfebrile temperatures need not absolutely be rejected, they can be cautiously irradiated provided one uses the feeble dosage of the first group. The more acute the case and the slighter the results of the reaction to irradiation, the larger the dosage indicated. In chronic types of pulmonary tuberculosis, in which catarrhal phenomena are present, even the dosage of the third group can sometimes be administered. Similar opinions may be advanced for surgical tuberculosis. The combination of ultraviolet rays with visible light and infrared rays is often indicated in tuberculosis. There is a curative effect in this combination that is often unappreciated.

The influence of ultraviolet irradiation on psychical symptoms also depends on the dosage. Medium and large doses exert a refreshing and stimulating action, while on the other hand a calming effect can be obtained by very feeble doses (L. E. D. and less), which is sometimes useful in treatment of insomnia.

Therapy with Long Wavelength X-Rays (Grenz Rays). Francis Carter Wood and George M. MacKee.

J. A. M. A. 96:111 (Jan. 10) 1931.

In this article Grenz rays are considered from every angle; physics, biologic effects, apparatus, technic, cutaneous reactions, and therapeutic indications and results. The authors feel that Grenz rays have a limited field of usefulness; that it is doubtful whether any skin disease (not an individual case) can be cured with Grenz rays that cannot be cured with roentgen rays of shorter wavelengths or with beta rays of radium. They list the conditions under which good results have been claimed for Grenz rays, and point out that the published reports are meager and come from comparatively few workers. There is need for corroborative reports before the real value of Grenz rays can be ascertained. A full bibliography is appended, and the article, though brief, is an excellent summary of the subject.—*Abs. Archives Dermatology & Syphilology*, 23:4:374 (April) 1931.

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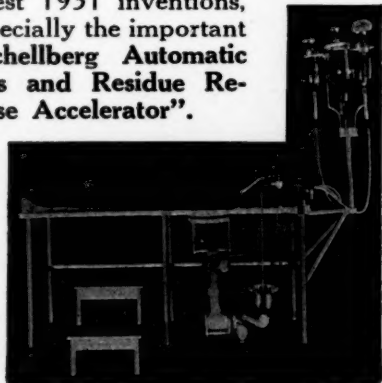
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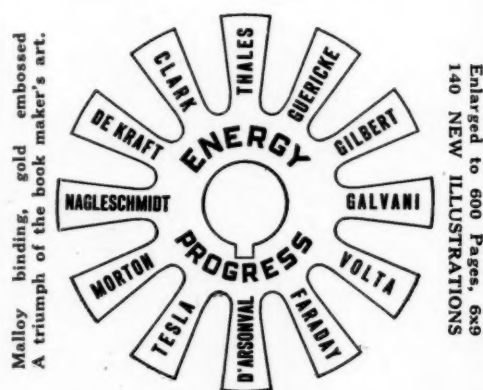
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